

AD-A129 143

TRACALS EVALUATION REPORT SOLID STATE INSTRUMENT
LANDING SYSTEM AN/GRN-29..(U) FACILITY CHECKING
SQUADRON (1866TH) (AFCS) SCOTT AFB IL

1/1

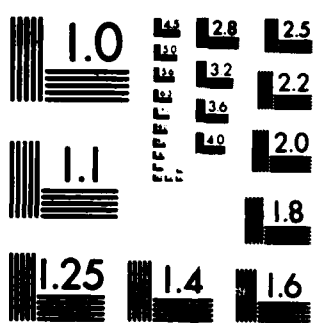
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M D CONLEY ET AL. 07 APR 83 81/66S-245

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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD A129143

⑨ Final Rept.

LEVEL II



①

AIR FORCE COMMUNICATIONS COMMAND

RACALS EVALUATION REPORT

SOLID STATE INSTRUMENT LANDING SYSTEM

AN/GRN-29(V)

SPECIAL EVALUATION REPORT

Tinker AFB, Oklahoma

8-20 December 1980

DTIC
ELECTE
MAY 18 1981

⑩ Marvin D. Conley
David E. Thibodeau



1274

Updated
7 Apr 83

Superseded
AD-A098957

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DEPARTMENT OF THE AIR FORCE
1866 FACILITY CHECKING SQUADRON (AFCC)
SCOTT AIR FORCE BASE, ILLINOIS 62225

2

REPLY TO
ATTN OF

TE (NAVAIDS Evaluation Section, AV 638-6384)

7 April 1983

SUBJECT

TRACALS letter 82/66L-347 to amend TRACALS Evaluation Report, 80/66S-244

TO See Distribution

1. The 1866th Facility Checking Squadron was tasked to perform a special evaluation of the Solid State Instrument Landing System (SSILS) at Tinker AFB, Oklahoma, and produce an amendment to the TRACALS Evaluation Report 80/66S-244. Authority for this action was HQ AFCC/FFNM (now ATTE) letter dated 27 September 1982 referencing CCD/LGM message 232110Z September 1982. The purpose of the evaluation was to update the last TRACALS Evaluation Report after a frequency change of the SSILS and to look at a localizer scalloping problem.

2. The results of the ground equipment checks indicated the localizer was operating within technical order (TO) specifications. The phasing of the course and clearance systems of both transmitters was optimized prior to the flight evaluation. Analysis of the localizer facility siting reconfirmed that line of sight coverage of the runway threshold was limited. The hump in the ground elevation immediately in front of the antenna array reduces the signal strength in the area of the restriction. The flight evaluation conducted by the 1866 FCS reconfirms that the on-course signal begins a gradual bend outside the middle marker and becomes scalloped as the aircraft flies inbound. The severe scalloping on the localizer crosspointer trace results from localizer signal reflections off the buildings along the east side of the runway. Sideband energy transmitted from the antenna array strikes the flat vertical surfaces of these buildings and is reflected at an angle equal to the incident angle. This results in sideband energy being present where a sideband null should exist on centerline; this is approximately in the area from one nautical mile beyond the middle marker to touchdown. This energy, depending on the path length, adds in phase or out of phase to the C+SB component to produce an alternating condition of predominating 90 or 150 hertz, resulting in the observed scalloping. The terrain conditions amplify the reflection problem. The terrain immediately in front of the localizer array rises, which causes screening to become a factor. The Runway 17 threshold is approximately 30 feet below the localizer line of sight coverage. The terrain is relatively flat in the direction of the buildings that cause the reflections; therefore, the energy from the reflective surfaces that combines with the direct energy on course is higher in magnitude than would be the case if the intervening terrain allowed line of sight coverage of the Runway 17 threshold. Excursions on the crosspointer trace exceed AFM 55-8 tolerances as can be seen from Attachment 5. The reflection off of the large hangar doors on building 3102 are most likely the cause of the localizer alignment measurements exceeding these tolerances. Analysis of reflection cancellation methods such as cancellation wires and corrective "cosmetic" panels indicate the cost of such methods would be greater than their benefits, especially since the Runway 17 SSILS is a Category I system. The restriction "localizer unusable from middle marker inbound" should remain. As mentioned in the original report, an approximate 30 percent reduction in the severity of the scalloping can be accomplished by widening the course width from 3.3 to 5.0 degrees. This non-tailored course width would be in accordance with AFM 55-8, Change 32, para 217.3206.

PROVIDING THE REINS OF COMMAND

83 06 01 062

83 05 09 165

3. The glide slope was operating within TO specifications, as revealed by the facility ground equipment checks. The flight evaluation indicated the glide slope met AFM 55-8 flight inspection requirements as a Category I facility. A step, at times, was noted above path which made determination of a repeatable path width difficult. No significant glide slope performance deficiencies were detected. A fly down indication was noted from Point B to threshold. Terrain in the first Fresnel zone is the most likely cause. The original report provides further discussion of this.

4. Attachments 4 through 8 of this letter reflect the current changes in equipment operating conditions due to the frequency change. The SSILS frequency change did not change any of the narrative of the previous TRACALS Evaluation Report. Please ensure the contents of this amendment are disseminated to all users of this report within your unit. This letter should be attached to the previous report for future reference.

Robert B. Nicholson
ROBERT B. NICHOLSON, Lt Col, USAF
Commander

8 Atchs:

1. Distribution
2. HQ AFCC/FFNM ltr dated 27 September 1982
3. CCD/LGM msg 232110Z September 1982
4. SSILS Localizer Performance Checklist
5. Localizer Ground Check Record
6. Null Reference SSILS Glide Slope Performance Checklist
7. Flight Inspection Report-Instrument Landing System
8. Runway 17 SSILS Localizer Alignment

DISTRIBUTION

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Atch 1



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE COMMUNICATIONS COMMAND
SCOTT AIR FORCE BASE, ILLINOIS 62225

27

REPLY TO
ATTN OF

FFNM

SUBJECT

Special TRACALS Evaluation, Tinker AFB OK, AN/GRN-29 (CCD/LGM 232110 Sep 82)

TO

1866 FCS/TE

Request you provide a team to support the subject evaluation. Team should be available to gather and assemble data during the flight check which is tentatively scheduled for 26 or 27 Sep 82. Data should be gathered which will allow you to amend Report No. 80/665-244.

FOR THE COMMANDER

Richard C. Davis

RICHARD C. DAVIS, Col, USAF
Director, TRACALS Management
DCS/Air Traffic Services

PROVIDING THE REINS OF COMMAND

Atch 2

28 SEP 82

MSG HSB727

ROUTINE

267 0205

AFCC AFCC
FF-5 LG-4

1866

2

RTTUZYUW RUEDBJA2993 2662119-UUUU--RMCUABA.

ZNR UUUUU

* 232110Z SEP 82

FM CCB GRIFFISS AFB NY//LGM//

TO RMCUABA/HO AFCC SCOTT AFB IL//FFN/LGMK//

INFO RMCUABA/1866FCS SCOTT AFB IL//TE//

CUVDAAA/1985CS TINKER AFB OK//LGM/FFN//

BT

UNCLAS

SUBJ: SPECIAL TRACALS EVALUATION TINKER AFB AN/GRN-29
REQUEST A SPECIAL TRACALS EVALUATION BE CONDUCTED DURING THE WEEK OF
27 SEP-3 OCT 82 ON THE TINKER AFB AN/GRN-29 TO UPDATE THE DEC 80
EVALUATION REPORT AND RESTORE THE FACILITY TO SERVICE. PRESENTLY
THE ILS IS OUT OF SERVICE DUE TO MAINTENANCE CHANGING THE FREQUENCY
TO PROVIDE TINKER AFB WITH DISCRETE FREQUENCIES. THIS LOCALIZER HAS
A RESTRICTION FROM THE MIDDLE MARKER IN DUE TO SEVERE SCALLOPING.
WE FEEL IT IMPERATIVE TO GET A FRESH LOOK AT THE LOCALIZER TO DETER-
MINE THE OPERATIONAL CAPABILITIES AND LIMITATIONS OF THE SYSTEM AT
THE NEW FREQUENCY AND PUBLISH AN UPDATED REPORT FOR FUTURE REFERENCE.
THIS CONFIRMS TELECON WITH MR. CONLEY AFCC/FFN, MR. SMITH 1985CS AND
MR. BARNES THIS OFFICE.

BT

#2943

NNNN

ROUTINE

MLN 9931

27 SEP 1982

Atch 3

SSILS LOCALIZER PERFORMANCE CHECKLIST

MONTH AND YEAR
September 1982

FACILITY LOCATION/RUNWAY

Tinker AFB Rwy 17

EQUIPMENT AND SERIAL NUMBER

AN/GRN-30 S/N 77007

TECHNICIAN

TSgt Miller

CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	FINAL	INITIAL	FINAL	
CRS CARRIER PWR			15W		15W	
CRS SIDEBAND PWR			310mW		310mW	
CLR CARRIER PWR			3.9W		4W	
CLR SIDEBAND POWER			120mW		120mW	
COURSE % MODULATION			40%		40%	
90Hz % MODULATION			20%		20%	
180Hz % MODULATION			20%		20%	
CLEARANCE % MOD			40%		40%	
90Hz % MODULATION			20%		20%	
180Hz % MODULATION			20%		20%	
CRS PWR SUPPLY 1 (METER INDICATION)						
Q5 DC OUT	0.75 TO 3.5A		1.4		2.7	
Q4 DC OUT	0.75 TO 3.5A		1.4		2.7	
DC OUT	26.5 TO 29.5V		29.0		29.0	
PRE REG	30 TO 38V		36.0		36.0	
CRS PWR SUPPLY 2						
Q9 DC OUT	0.75 TO 3.5A		1.7		2.9	
Q10 DC OUT	0.75 TO 3.5A		1.6		2.9	
DC OUT	26.5 TO 29.5V		29.0		29.0	
PRE REG	30 TO 38V		36.0		36.0	
CRS XMTR						
OSC TUNE	0.5 MIN		1.1		1.1	
EXCTR OUTPUT	0.85 TO 3.0		1.25		1.95	
CSB PA	1.0 TO 3.25		2.3		2.5	
SBO PA	0.75 TO 1.95		1.3		1.0	
CSB PWR OUT	0.50 TO 2.0		1.75		1.85	
DC IN	2.2 TO 3.5 x10		27.0		27.5	
DC IN	1.0 TO 6.7		4.6		4.8	
SBO PWR OUT	0.5 TO 2.5		1.1		0.85	
CLR PWR SUPPLY 1						
Q5 DC OUT	0.75 TO 3.5A		1.2		2.2	
Q4 DC OUT	0.75 TO 3.5A		1.2		2.2	
DC OUT	26.5 TO 29.5V		29.0		29.0	
PRE REG	30 TO 38		36.5		36.0	
CLR PWR SUPPLY 2						
Q9 DC OUT	0.75 TO 3.5A		1.7		2.9	
Q10 DC OUT	0.75 TO 3.5A		1.7		2.3	
DC OUT	26.5 TO 29.5V		29.0		29.0	
PRE REG	30 TO 38		37.0		36.5	
CLR XMTR						
OSC TUNE	0.5 MIN		1.2		1.5	
EXCTR OUTPUT	0.85 TO 3.0		1.95		1.9	
CSB PA	1.0 TO 3.25		1.5		1.4	
SBO PA	0.50 TO 2.0		1.2		1.1	
CSB PWR OUT	0.20 TO 1.95		0.75		0.75	
DC IN	2.2 TO 3.5 x10		28.0		27.0	
DC IN	1.0 TO 6.7		3.4		3.2	
SBO PWR OUT	0.20 TO 2.5		0.75		0.85	

REMARKS

CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	FINAL	INITIAL	FINAL	
CRS MONITOR 1						
TEST DDM	0.500 ± 0.02		.505		.505	
COURSE DDM	0.000 ± 0.011		.006		.005	
WIDTH DDM	0.141 TO 0.175		.155		.156	
RF LEVEL	100.0 ± 10.0		100.6		100.0	
% MOD	LAST FC ± 4.0%		40.9%		41.1%	
ID% MOD	005.0 ± 2.0		4.7		4.8	
CRS MONITOR 2						
TEST DDM	0.500 ± 0.02		.503		.504	
COURSE DDM	0.000 ± 0.011		.006		.005	
WIDTH DDM	0.141 TO 0.175		.155		.155	
RF LEVEL	100.0 ± 10.0		101.3		100.7	
% MOD	LAST FC ± 4.0%		41.4%		41.7%	
ID% MOD	005.0 ± 2.0		4.9		5.1	
CLR MONITOR 1						
TEST DDM	0.500 ± 0.02		.498		.498	
COURSE DDM	0.000 ± 0.026		.000		.000	
WIDTH DDM	0.129 TO 0.181		.157		.155	
RF LEVEL	100.0 ± 10.0		101.2		101.7	
% MOD	LAST FC ± 4.0%		41.9%		43.4%	
ID % MOD	005.0 ± 2.0		4.8		5.0	
FREQ SEP	9.5 ± 1.0		9.4		10.0	
CLR MONITOR 2						
TEST DDM	0.500 ± 0.02		.502		.502	
COURSE DDM	0.000 ± 0.026		.007		.005	
WIDTH DDM	0.129 TO 0.181		.157		.156	
RF LEVEL	100.0 ± 10.0		101.9		102.5	
% MOD	LAST FC ± 4.0%		42.4%		43.9%	
ID % MOD	005.0 ± 2.0		5.0		5.2	
FREQ SEP	9.5 ± 1.0		9.5		10.1	
CRS ALARM LIMITS						
COURSE MONITOR		MONITOR 1		MONITOR 2		
ID % MOD LOWER	003.0 ± 0.5					
UPPER	18.40 ± 3.0					
% MOD LOWER	004.0 BELOW NORMAL					
UPPER	004.0 ABOVE NORMAL					
RF LEVEL LOWER						SEE NOTE #1
WIDTH DDM LOWER	0.141 ± 0.002					
UPPER	0.175 ± 0.002					
COURSE DDM						
UPPER	0.011 ± 0.004					
TEST DDM LOWER	0.426 ± 0.03					
UPPER	0.557 ± 0.03					
CLR ALARM LIMITS						
FREQ SEP LOWER	5.000 ± 0.2					
UPPER	14.00 ± 0.2					
ID % MOD LOWER	003.0 ± 0.5					
UPPER	018.4 ± 3.0					
% MOD LOWER	4.0 BELOW NORMAL					
UPPER	4.0 ABOVE NORMAL					
RF LEVEL LOWER						SEE NOTE #1
WIDTH DDM LOWER	0.129 ± 0.002					
UPPER	0.181 ± 0.002					
COURSE DDM						
UPPER	0.026 ± 0.004					
TEST DDM LOWER	0.426 ± 0.03					
UPPER	0.557 ± 0.03					

NOTE 1. REFERENCE READINGS MAY VARY AS PER FACILITY, CHECK TO 31R4-2GRN30-2.

Page 2 of 8

Atch 4

FAR FIELD MONITOR 1 TESTS	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS	
		INITIAL	FINAL	INITIAL	FINAL		
DDM	0.000 ± 0.005		.004/150				
DDM ALARM	0.011 ± 0.004		.011				
% MOD	40.0 ± 10.0		43.0				
% MOD ALARM	20.0 ± 1.0		20.0				
FAR FIELD MONITOR 2 TESTS							
DDM	0.000 ± 0.005		.005/150				
DDM ALARM	0.011 ± 0.004		.011				
% MOD	40.0 ± 10.0		46.0				
% MOD ALARM	20.0 ± 1.0		20.0				
SUBSYSTEM MEASUREMENTS							
CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2			
		INITIAL	FINAL	INITIAL	FINAL		
CARRIER FREQUENCY							
COURSE	0.002%						
CLEARANCE	0.002%						
MODULATION BALANCE							
COURSE	CENTERLINE		.000		.000		
CLEARANCE	NEARFIELD 30°		.000		.000		
PHASING							
COURSE 150Hz	FARFIELD 3°		.006/150		.008/150		
COURSE 90Hz			.020/150		.018/150		
CLEARANCE 150Hz	NEARFIELD 30°		.018/150		.024/150		
CLEARANCE 90Hz			.012/90		.016/90		
COURSE IN-LINE							
CLEARANCE IN-LINE							
DISTANCE TO COURSE FARFIELD PHASING POINT							
ANTENNA VSWR							
CHECK	SPECIFICATION	dB	VSWR	CHECK	SPECIFICATION	dB	VSWR
1L	> 20.85dB / < 1.2:1			1R			
2L				2R			
3L				3R			
4L				4R			
5L				5R			
6L				6R			
7L				7R			

REMARKS

DISTRIBUTION UNIT CHECKS (CONTINUED)

COURSE DU C+SB AMPLITUDES

CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS
7L(J9)	0.147 - 0.173		7R(J16)		7L-7R	±0.010	
6L(J8)	0.147 - 0.173		6R(J15)		6L-6R	±0.010	
5L(J7)	0.483 - 0.530		5R(J14)		5L-5R	±0.030	
4L(J6)	REF ± 0.030		4R(J13)	0.481	4L-4R	±0.030	
3L(J5)	0.657 - 0.771		3R(J9)		3L-3R	±0.040	
2L(J4)	0.920 - 1.080		2R(J8)		2L-2L	±0.060	
1L(J3)	0.821 - 0.964		1R(J7)		1L-1R	±0.054	

COURSE DU C+SB SIGNAL PHASE

CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	ERROR	REMARKS
7L(J9)	+82			7R(J16)	0			
6L(J8)	+82			6R(J15)	0			
5L(J7)	+82			5R(J14)	0			
4L(J6)	+82			4R(J13)	0			
3L(J5)	+82			3R(J9)	0			
2L(J4)	+82			2R(J8)	0			
1L(J3)	+82			1R(J7)	0			

COURSE DU SBO AMPLITUDES

CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS
7L(J9)	0.330 - 0.404		7R(J16)		7L-7R	±0.012	
6L(J8)	0.443 - 0.589		6R(J15)		6L-6R	±0.018	
5L(J7)	0.818 - 0.960		5R(J14)		5L-5R	±0.029	
4L(J6)	REF + 0.033		4R(J13)	1.000	4L-4R	±0.033	
3L(J5)	0.940 - 1.060		3R(J9)		3L-3R	±0.033	
2L(J4)	0.614 - 0.720		2R(J8)		2L-2R	±0.022	
1L(J3)	0.204 - 0.240		1R(J7)		1L-1R	±0.014	

COURSE DU SBO SIGNAL PHASE

CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	ERROR	REMARKS
7L(J9)	-98			7R(J16)	0			
6L(J8)	-98			6R(J15)	0			
5L(J7)	-98			5R(J14)	0			
4L(J6)	-98			4R(J13)	0			
3L(J5)	-98			3R(J9)	0			
2L(J4)	-98			2R(J8)	0			
1L(J3)	-98			1R(J7)	0			

COURSE PHASE ERROR

CHECK	CSB ERR	SBO ER	DIFF	CHECK	CSB ERR	SBO ER	DIFF	REMARKS
7L(J9)				7R(J16)				
6L(J8)				6R(J15)				
5L(J7)				5R(J14)				
4L(J6)				4R(J13)				
3L(J5)				3R(J9)				
2L(J4)				2R(J8)				
1L(J3)				1R(J7)				

SPREAD

REMARKS

Measurements indicated on this page were spot checked but not recorded.

DISTRIBUTION UNIT CHECKS (CONTINUED)

CLR DU C-SB AMPLITUDES							
CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS
3L(J5)	0.184 - 0.216		3R(J9)		3L-3R	±0.012	
1L(J3)	REF ± 0.060		1R(J7)	1.000	1L-1R	± 0.060	
CLR C-SB SIGNAL PHASE							
CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	ERROR
3L(J5)	+82			3R(J9)	0		
1L(J3)	+82			1R(J7)	0		
CLR DU SBO AMPLITUDES							
CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS
3L(J5)	0.121 - 0.157		3R(J9)		3L-3R	±0.005	
2L(J4)	0.306 - 0.360		2R(J8)		2L-2R	±0.010	
1L(J3)	REF ±0.033		1R(J7)	1.000	1L-1R	±0.033	
CLR SBO SIGNAL PHASE							
CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	ERROR
3L(J5)	-98			3R(J9)	0		
2L(J4)	-98			2R(J8)	0		
1L(J3)	-98			1R(J7)	0		
CLR PHASE ERROR							
CHECK	CSB ERR	SBO ERR	DIFF	CHECK	CSB ERR	SBO ERR	DIFF
3L(J5)				3R(J9)			
2L(J4)				2R(J8)			
1L(J3)				1R(J7)			
SPREAD							
ANTENNA NULLS							
PAIR	SPECIFICATION	INITIAL	FINAL	PAIR	SPECIFICATION	INITIAL	FINAL
1	10° at the northfield ekpts.		2"/150	5			0
2			2"/150	6			2"/90
3			0	7			4"/90
4			0	COMP			0
RECOMBINING UNIT NULLS							
PAIR	SPECIFICATION	INITIAL	FINAL	PAIR	SPECIFICATION	INITIAL	FINAL
1	CLR ± 0.020/CRS ± 0.006		.004/90	5	CRS ± 0.006		.002/90
2	CRS ± 0.003		.000	6	CRS ± 0.006		.000
3	CRS ± 0.003		.002/90	7	CRS ± 0.006		.001/150
4	CRS ± 0.006		.000	COMP	CRS ± 0.003		
CABLING PHASE SHIFTS							
ANTENNA FEEDLINES				MONITOR RETURN			
CHECK		INITIAL	FINAL	CHECK		INITIAL	FINAL
7L				7L			
6L				6L			
5L				5L			
4L				4L			
3L				3L			
2L				2L			
1L				1L			
1R				1R			
2R				2R			
3R				3R			
4R				4R			
5R				5R			
6R				6R			
7R				7R			
REMARKS							

DISTRIBUTION UNIT CHECKS (CONTINUED)

PHASE AT ANTENNA INPUT (COURSE)

ANTENNA	C+SB	SBO	ANTENNA	C+SB	SBO	REMARKS
7L	REF (0°)	REF (0°)	7R			
6L			6R			
5L			5R			
4L			4R			
3L			3R			
2L			2R			
1L			1R			

PHASE AT ANTENNA INPUT (CLEARANCE)

ANTENNA	C+SB	SBO	ANTENNA	C+SB	SBO	REMARKS
3L	REF (0°)	REF (0°)	3R			
2L	-		2R	-		
1L			1R			

MONITOR OFFSETS IN MOD BALANCE

TRANSMITTER NO. 1

TRANSMITTER NO. 2

REMARKS

COURSE MON #1	COURSE DDM	.002/150	.002/150	
COURSE MON #1	WIDTH DDM	.006/150	.005/150	
COURSE MON #2	COURSE DDM	.002/150	.002/150	
COURSE MON #2	WIDTH DDM	.006/150	.005/150	
CLEAR MON #1	COURSE DDM	.001/90	.001/90	
CLEAR MON #1	WIDTH DDM	.003/90	.004/90	
CLEAR MON #2	COURSE DDM	.001/90	.000	
CLEAR MON #2	WIDTH DDM	.005/90	.007/90	

WIDTH MONITOR INDICATION IN QUADRATURE

COURSE MON #1	WIDTH DDM	.005/150	.005/150	
COURSE MON #2	WIDTH DDM	.006/150	.005/150	
CLEAR MON #1	WIDTH DDM	.019/90	.018/90	
CLEAR MON #2	WIDTH DDM	.021/90	.020/90	

MONITOR COMBINING NETWORK IN NORMAL

COURSE WIDTH DDM			
CLEAR WIDTH DDM			

MONITOR COMBINING NETWORK IN QUADRATURE

COURSE WIDTH DDM			
CLEAR WIDTH DDM			

REMARKS

RECORD OF FLIGHT EVALUATION

CONFIGURATION	INDICATION	TX 1	TX 2
POWER RATIO	COURSE C+SB POWER		
	AIRBORNE MEASUREMENT		
	CLEARANCE C+SB POWER		
	AIRBORNE MEASUREMENT		
	dB DIFFERENCE		
COURSE MODULATION	DIAL INDICATION	20.2	20.2
	MONITOR READING	41.1	41.1
	AIRBORNE MEASUREMENT	20.2	20.2
MODULATION BALANCE	DIAL INDICATION	5.0	5.0
	AIRBORNE MEASUREMENT	0	0
CLEARANCE MODULATION	DIAL INDICATION		
	MONITOR READING		
	AIRBORNE MEASUREMENT		
MODULATION BALANCE	DIAL INDICATION		
	AIRBORNE MEASUREMENT		
CLEARANCE WIDTH	DIAL INDICATION		
	SBO POWER		
	MONITOR READING		
	AIRBORNE MEASUREMENT		
COURSE NORMAL WIDTH	DIAL INDICATION	25	
	SBO POWER	300mW	
	MONITOR READING	.155	
	AIRBORNE MEASUREMENT	3.2	
MONITOR ALARMS			
COURSE WIDE	DIAL INDICATION	N/A	N/A
	SBO POWER	260mW	260mW
	MONITOR READING	.141	.141
	AIRBORNE MEASUREMENT	3.8	3.6
COURSE NARROW CLEARANCE WIDE	COURSE DIAL INDICATION	N/A	N/A
	COURSE SBO POWER	390mW	380mW
	COURSE MONITOR READING	.175	.175
	CLEARANCE DIAL INDICATION	N/A	N/A
	CLEARANCE SBO POWER	100mW	100mW
	CLEARANCE MONITOR READING	.129	.126
	AIRBORNE MEASUREMENT	2.9	3.0
COURSE ADVANCE ALARM	SIDEBAND PHASER NORMAL		
	SIDEBAND PHASER ALARM		
	MONITOR READING		
	AIRBORNE MEASUREMENT		
COURSE RETARD ALARM	SIDEBAND PHASER NORMAL		
	SIDEBAND PHASER ALARM		
	MONITOR READING		
	AIRBORNE MEASUREMENT		
CLEARANCE ADVANCE ALARM	SIDEBAND PHASER NORMAL		
	SIDEBAND PHASER ALARM		
	MONITOR READING		
	AIRBORNE MEASUREMENT		
CLEARANCE RETARD ALARM	SIDEBAND PHASER NORMAL		
	SIDEBAND PHASER ALARM		
	MONITOR READING		
	AIRBORNE MEASUREMENT		

REMARKS

CONFIGURATION	INDICATION	TX 1	TX 2
USEABLE DISTANCE			
CLEARANCE CARRIER NORMAL	CLEARANCE POWER	4W	4W
	RF MONITOR READING	.153	.153
CLEARANCE RF ALARM	CLEARANCE POWER	3.2W	3.2W
	RF MONITOR READING	89.5	90.0
COURSE CARRIER NORMAL	COURSE POWER	15W	15W
	RF MONITOR READING	.155	.155
COURSE RF ALARM	COURSE POWER	12W	12W
	RF MONITOR READING	89.6	89.4
FINAL ALIGNMENT			
MODULATION BALANCE CONTROL	DIAL INDICATION	5.0	5.0
	MONITOR READING	.007/150	
	AIRBORNE MEASUREMENT	7uA/150	
ALIGNMENT MONITOR ALARM			
90 HZ	DIAL INDICATION	6.7	
	MONITOR READING	.011	.011
	AIRBORNE MEASUREMENT		
150 HZ	DIAL INDICATION	4.6	
	MONITOR READING	.011	.011
	AIRBORNE MEASUREMENT		

REMARKS

LOCALIZER GROUND CHECK RECORD

FACILITY LOCATION/RUNWAY							EQUIPMENT SERIAL NO				YEAR			
Tinker AFB Rwy 17							77007				1982			
DATE													29 Sept	
FUNCTION	INITIAL COMPOSITE		COURSE ONLY		CLEARANCE ONLY		COURSE QUAD		CLEARANCE QUAD		WORST CASE		FINAL COMPOSITE	
XMTR NO.	1	2	1	2	1	2	1	2	1	2	1	2	1	2
90HZ	35												.380	.385
	30												.375	.380
	25												.380	.385
	20												.420	.430
	15												.420	.420
	10												.380	.390
	9												.380	.385
	8												.380	.390
	7												.390	.400
	6												.395	.400
	5												.390	.390
	4												.365	.370
	3												.280	.280
	2												.180	.185
	W/P												.145	.150
	1												.090	.090
	0												.006	.006
	1												.150	.150
	W/P												.100	.100
	2												.155	.155
150HZ	2												.190	.190
	3												.290	.285
	4												.380	.395
	5												.420	.400
	6												.420	.420
	7												.410	.410
	8												.400	.380
	9												.390	.355
	10												.400	.390
	15												.420	.420
	20												.420	.435
	25												.405	.420
	30												.380	.380
	35												.400	.400

REMARKS

NULL REFERENCE SSILS GLIDE SLOPE PERFORMANCE CHECKLIST						MONTH AND YEAR
FACILITY LOCATION/RUNWAY		EQUIPMENT AND SERIAL NUMBER				TECHNICIANS
Tinker AFB RWY 17		AN/GRN-31				TSgt Miller
CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	FINAL	INITIAL	FINAL	
CARRIER PWR			3W		3W	
SIDEBAND PWR			31mW		31mW	
COURSE & MODULATION			80.6		79.2	
90Hz % MODULATION			40.3		39.7	
150Hz % MODULATION			40.3		39.5	
CRS PWR SUPPLY 1		(METER INDICATION)				
Q5 DC OUT	0.75 TO 3.5A		1.4		1.4	
Q4 DC OUT	0.75 TO 3.5A		1.5		1.6	
DC OUT	26.5 TO 29.5 V		28.0		28.0	
PRE REG	30 TO 38 V		35.5		35.0	
CRS PWR SUPPLY 2						
Q9 DC OUT	0.75 TO 3.5 A		1.4		1.5	
Q10 DC OUT	0.75 TO 3.5 A		1.4		1.4	
DC OUT	26.5 TO 29.5		28.0		28.0	
PRE REG	30 TO 38 V		35.0		35.0	
CRS XMTR						
XTAL DRIVE	0.5 MIN		1.45		1.45	
TRIPLER INPUT	0.2 TO 3.8		3.75		2.90	
EXCTR OUTPUT	0.5 TO 3.0		1.80		1.85	
EXCTR ALG	0.7 TO 3.0		2.30		2.90	
SBO DRIVER	0.2 TO 0.59		0.35		0.33	
CSB DRIVER	0.49 TO 1.50		0.70		0.70	
CSB PWR OUT	0.50 TO 3.90		2.10		2.35	
DC IN	22 TO 35		26.5		27.0	
DC IN	1.0 TO 3.0		1.80		1.80	
SBO PWR OUT	0.50 TO 4.0		1.60		1.95	
CRS MONITOR 1						
TEST DDM	0.500 ± 0.020		.496		.496	
PATH (Int mon)	0.000 ± 0.050		.006/150		.003/150	
PATH (Near field)	0.000 ± 0.050		.007/90		.010/90	
WIDTH DDM	0.175 OPTIMUM		.168		.173	
RF LEVEL	100.0 ± 5.0		102.4		103.3	
% MOD			77.8		76.4	SEE NOTE #1
CRS MONITOR 2						
TEST DDM	0.500 ± 0.020		.501		.501	
PATH (Int mon)	0.000 ± 0.050		.006/150		.004/150	
PATH (Near field)	0.000 ± 0.050		.008/90		.011/90	
WIDTH DDM	0.175 OPTIMUM		.169		.174	
RF LEVEL	100.0 ± 5.0		104.5		105.6	
% MOD			80.1		78.7	SEE NOTE #1
CRS ALARM LIMITS						
COURSE MONITOR		MONITOR 1		MONITOR 2		
TEST DDM LOWER	0.426 ± 0.040		.413			
UPPER	0.557 ± 0.040		.544			
PATH (Int) UPPER	.080 ± 0.002		.050			
PATH (Near) UPPER	.080 ± 0.002		.050			
WIDTH DDM LOWER			.155			SEE NOTE #1
UPPER			.195			SEE NOTE #1
RF LEVEL LOWER			72.1			SEE NOTE #1
% MOD LOWER	NORMAL -004.0		73.8			
UPPER	NORMAL + 004.0		81.8			

CHECK	SPECIFICATION	TRANSMITTER #1		TRANSMITTER #2	
		INITIAL	FINAL	INITIAL	FINAL
RADIO FREQUENCY	± .002%		332.291731		332.296492
GROUND CHECK			FINAL		FINAL
ZERO DDM			11'5½" .000		11'6" .000
ABOVE PATH			14'8" .175		14'6" .175
BELOW PATH			8'2" .175		8'5½" .175
BELOW PATH QUAD			8'2" .004/150		8'5½" .010/150
PHASING					
SNIFFER MOD BALANCE					
MOD BALANCE FARFIELD			.002/90		.006/90
FARFIELD			.110/90		.115/90
RF COMBINING UNIT WIDTH OUTPUTS					
MOD BALANCE					
QUADRATURE					
NORMAL					
MONITOR OFFSETS MOD BALANCE		MONITOR 1	MONITOR 2	MONITOR 1	MONITOR 2
PATH (In) INTERNAL		.000	.001/90	.003/90	.002/90
PATH (NF) NEARFIELD		.000	.001/90	.003/90	.004/90
WIDTH		.004/90	.001/90	.007/90	.003/90
IN QUADRATURE READING					
WIDTH		.004/150	.007/150	.007/150	.010/150
ANTENNA VSWR		dB		VSWR	
UPPER ANTENNA	7-20.85 dB ± 1.21	-32		1.05:1	
LOWER ANTENNA		-33		1.05:1	
REMARKS					

NOTE 1. REFERENCE READINGS MAY VARY AS PER FACILITY. CHECK TO 31R4-2GRN31-2.

RECORD OF FLIGHT EVALUATION

CONFIGURATION	INDICATION	TX 1	TX 2
COURSE MODULATION	DIAL INDICATION	40.0	
	MONITOR READING (%MOD)	77.9	
	AIRBORNE INDICATION	80.9%	79.0%
COURSE MODULATION BALANCE	DIAL INDICATION	5.00	5.0
	AIRBORNE MEASUREMENT	0uA	0uA
NORMAL WIDTH & ANGLE	NORMAL ANGLE	2.5	2.49
	WIDTH	0.67	0.70
	STRUCTURE BELOW PATH		
	CLEARANCES		
	SBO DIAL INDICATION	33.5	36.0
	SBO POWER	32mW	32mW
	MONITOR READING (WIDTH)	.175	.173
NARROW ALARM	ANGLE		
	WIDTH		
	STRUCTURE BELOW PATH		
	SBO DIAL INDICATION		
	SBO POWER		
	MONITOR READING (WIDTH)		
WIDE ALARM	ANGLE	2.51	2.49
	WIDTH	0.89	0.79
	STRUCTURE BELOW PATH		
	SBO DIAL INDICATION		
	SBO POWER	22mW	26mW
	MONITOR READING (WIDTH)	.155	.154
ADVANCE PHASE TO ALARM	SIDE BAND PHASER NORMAL		
	SIDE BAND PHASER ALARM		
	DEGREES TO ALARM		
	ANGLE		
	WIDTH		
	STRUCTURE BELOW PATH		
	CLEARANCES		
	MONITOR READING (WIDTH)		
RETARD PHASE TO ALARM	SIDE BAND PHASER NORMAL		
	SIDE BAND PHASER ALARM		
	DEGREES TO ALARM		
	ANGLE		
	WIDTH		
	STRUCTURE BELOW PATH		
	CLEARANCES		
	MONITOR READING (WIDTH)		
USEABLE DISTANCE	COURSE RF POWER	1.5W	1.5W
	COURSE MONITOR READING (RF)	72.9	71.4
NORMAL WIDTH & ANGLE	NORMAL ANGLE		
	WIDTH		
	STRUCTURE BELOW PATH		
	CLEARANCES		
	SBO DIAL INDICATION		
	SBO POWER		
	MONITOR READING (WIDTH)		

REMARKS

FLIGHT INSPECTION REPORT—INSTRUMENT LANDING SYSTEM										Report Identification Symbol FSM 1-19			
1. STATION Tinker AFB, OK RWY 17					2. IDENT FRJ		3. DATE/DATES OF INSPECTION 9/28/82						
4. TYPE OF INSPECTION										5. COMMON SYSTEM			
SITE EVALUATION			PERIODIC			X SPECIAL FX			YES				
COMMISSIONING			SURVEILLANCE			INCOMPLETE			NO				
6. OWNER		PAA	U.S. ARMY		PRIVATE (Indicate actual owner)								
			U.S. NAVY										
			INTER-NATIONAL	X U.S.A.F.		OTHER (Indicate actual owner)							
				U.S.C.G.									
7. FACILITY/COMPONENT INSPECTED					X LOCALIZER		COMPASS LOCATORS		X 75 MHz MARKERS				
					X GLIDE SLOPE		DME		X LIGHTING SYSTEM				
8. LOCALIZER													
FRONT COURSE						COMMISSIONED WIDTH 3.30		BACK COURSE					
TX 1			TX 2			CATEGORY I		TX 1			TX 2		
OT	INIT	FINAL	OT	INIT	FINAL			OT	INIT	FINAL	OT	INIT	FINAL
		3.20			3.20	COURSE WIDTH							
		20.5			20.8	MODULATION							
						CLEARANCE 150							
						CLEARANCE 90							
		1/9.2			1/6.3	COURSE STRUCTURE—Z1							
		11/0.6			12/0.7	COURSE STRUCTURE—Z2							
		11/0.2			8/0.2	COURSE STRUCTURE—Z3							
		7ual			7ual	ALIGNMENT							
						VOICE							
		S			S	IDENTIFICATION							
		18			18	USABLE DISTANCE							
						MONITOR							
		2.90			2.85	COURSE WIDTH (Narrow)							
		3.80			3.60	COURSE WIDTH (Wide)							
		245/10			260/29	CLEARANCE 150							
		240/28			250/29	CLEARANCE 90							
		7			7	ALIGNMENT 150							
		13			12	ALIGNMENT 90							
9. GLIDE SLOPE													
TX 1			TX 2			COM'D ANGLE 2.50		10. GENERAL					
OT	INIT	FINAL	OT	INIT	FINAL	CATEGORY I		75 MHz MARKERS		SAT	UNSAT		
		80.0			79.0	MODULATION		COMPASS LOCATORS		X			
		2.46			2.42	ANGLE		DME (TIK TACAN)		X			
		0.68			0.71	WIDTH		LIGHTING SYSTEMS		X			
						CLEARANCE BELOW PATH		11. FACILITY STATUS					
		1.53			1.52	STRUCTURE BELOW PATH				F/C	G/S	B/C	
		2/5.4			3/4.6	PATH STRUCTURE—Z1		UNRESTRICTED			X		
		13/1.7			14/2.9	PATH STRUCTURE—Z2		RESTRICTED		X			
		11/0.2			21/0.3	PATH STRUCTURE—Z3		UNUSABLE					
		10			10	USABLE DISTANCE		NOTAM					
						MONITOR		HI/LO ILS RWY-17 NOTE: Loc unuseable MM inbound.					
						ANGLE (Low)							
						ANGLE (High)							
						PATH WIDTH (Wide)							
		0.89			0.78	CLEARANCE BELOW PATH							
12. REMARKS													
1. Special inspection for frequency and identification change of RWY 17 ILS.													
2. All periodic with monitor requirements met during this inspection.													
3. Localizer remains restricted as per reported dated 5/19/80.													
4. Published frequency 111.3.													
5. Simultaneous operation of ILS systems not authorized.													
REGION		FIELD OFFICE		FLIGHT INSPECTOR'S SIGNATURE									
		1866 FCS		EARL R. JOBSON, Major, USAF <i>Earl R Jobson</i>									

**FLIGHT INSPECTION REPORT—INSTRUMENT LANDING SYSTEM
SUPPLEMENT SHEET**[illegible]

TITLE

RUNWAY 17 SSILS LOCALIZER ALIGNMENT

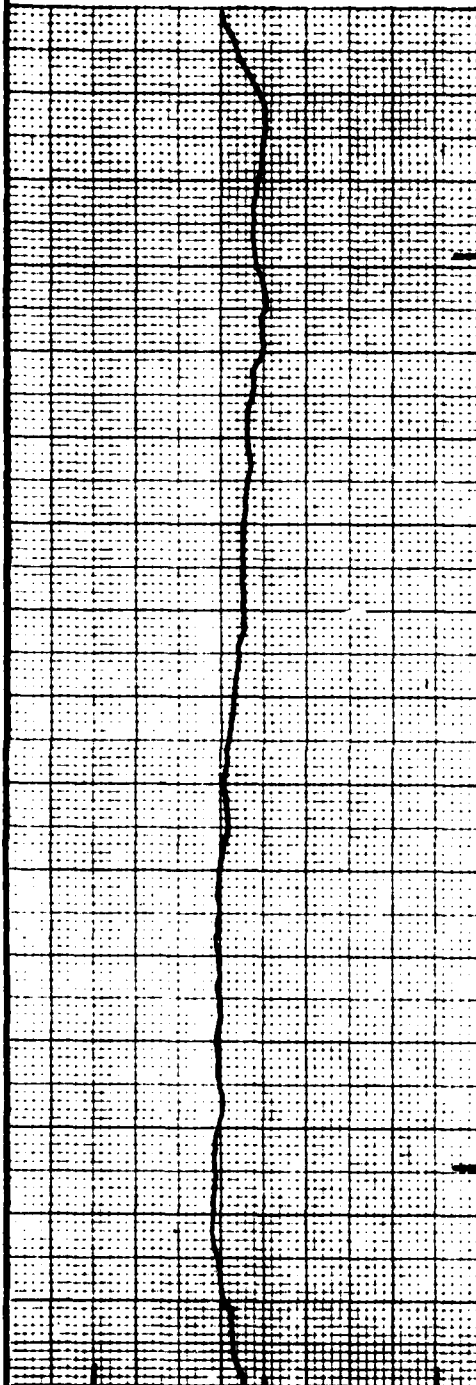
LOCATION

Tinker AFB

Rwy 17

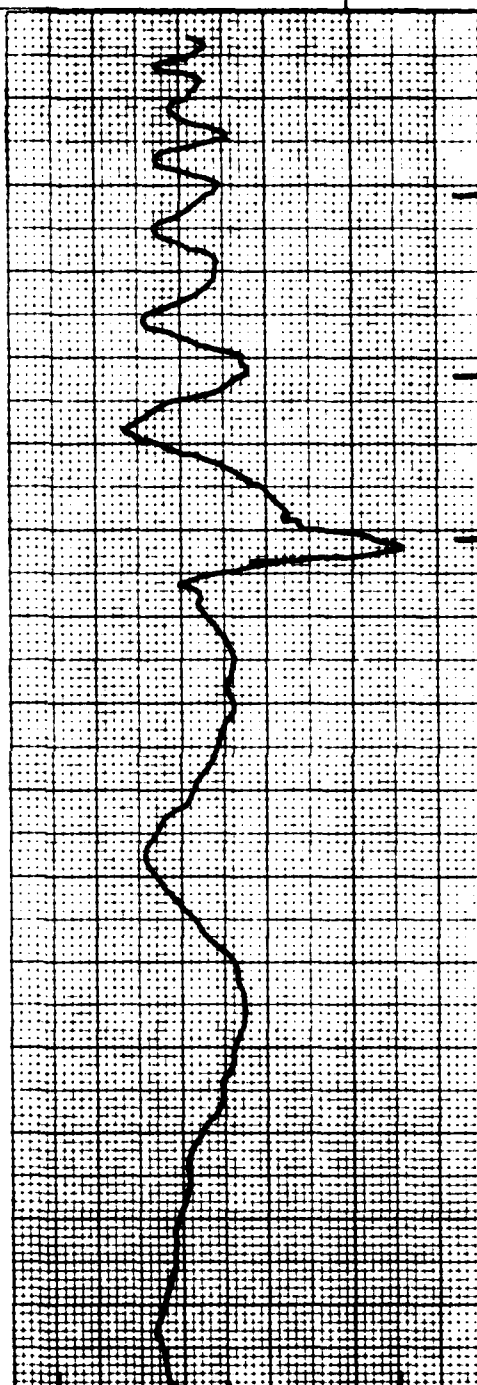
DATE

September 1982



3
DME

4
DME



G/S

TH

1000
FT

REMARKS

DEPARTMENT OF THE AIR FORCE
1866 Facility Checking Squadron
Scott AFB, Illinois

6 April 1981

SOLID STATE INSTRUMENT LANDING SYSTEM

AN/GRN-29(V)

SPECIAL EVALUATION REPORT

Tinker AFB, Oklahoma

80/66S-244

8-20 December 1980

Prepared by:

Marvin D. Conley
MARVIN D. CONLEY, GS-13
Electronics Engineer

David E. Thibodeau
DAVID E. THIBODEAU, MSgt, USAF
NAVAIDS Evaluation Technician

Approved by:

Cecil C. Robins
CECIL C. ROBINS, Lt Col, USAF
Commander

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7. AUTHOR(s) MARVIN D. CONLEY, GS-13 DAVID E. THIBODEAU, MSgt, USAF		6. PERFORMING ORG. REPORT NUMBER
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Traffic Control and Landing Systems (TRACALS) Solid State Instrument Landing System (SSILS) AN/GRN-29(V) Tinker AFB Oklahoma		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report presents the results of the 8-20 December 1980 Special TRACALS Evaluation of the Tinker AFB AN/GRN-29 SSILS. The evaluation was conducted to determine the capabilities and limitations of the system in its installed environment and determine the cause of the present localizer restriction. Results presented in this report can be used as a guide for anticipated performance until there is a significant change in ground equipment, siting environment, screening, or operational use.		

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SUBJECT

ATTACHMENTS (Continued)

17. Flight Inspection Report-Instrument Landing System
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20. Glide Slope Fresnel Zone Information

1. SUMMARY

1-1. Background. Wilcox Electric, Inc., began the installation of the AN/GRN-29 SSILS at Tinker AFB in December 1977. An official Federal Aviation Agency (FAA) flight inspection was requested to commission the facility in November 1978. The glide slope was commissioned as an unrestricted Category I facility. However, the localizer was restricted and declared "unusable below 300 feet within 1.0 nautical mile (NM) due to localizer reversals." The DD Form 250, Material Inspection and Receiving Report, was signed by Electronic Systems Division (ESD) since Wilcox Electric, Inc., had met their contractual obligation. The commander of Tinker AFB was hesitant to accept the AN/GRN-29 Solid State Instrument Landing System (SSILS) since its operation was not consistent with the base operational requirements. ESD requested the Traffic Control and Landing Systems (TRACALS) Engineering Branch of Southern Communications Area (SCA) to do an engineering analysis of the localizer at Tinker AFB. This analysis was completed in May 1979 and concluded the cause of the restriction was reflections from buildings 3001, 3102, and 3105. The effects of these reflections were minimized by positioning the antenna nulls using the stacking method and rephasing the system in the far field. The facility remained unrestricted from May 1979 to July 1980. The distribution unit was replaced in June 1980 and the FAA restoral flight inspection restricted the facility "unusable from the middle marker inbound." SCA/FFN then requested the 1866 FCS perform a special TRACALS Evaluation of the Runway 17 localizer.

1-2. Evaluation Profile. A Special TRACALS Evaluation was conducted during the period 8-20 December 1980 on the Tinker AFB AN/GRN-29 SSILS. The purpose of the evaluation was to determine the operational capabilities and limitations of the system in its installed environment and determine the exact nature and cause of the restriction to the Runway 17 localizer. The special evaluation was requested by SCA to determine why the facility was restricted inbound from the middle marker. To define the entire system capabilities, the glide slope facility was also evaluated. The evaluation consisted of three phases: ground equipment checks, facility siting, and flight evaluation. The ground equipment checks determine if the facility is operating within technical order (TO) specifications and what actions are necessary to optimize the system. The facility siting was evaluated to identify any possible interference to the radiated signal. The flight evaluation determines the exact nature of the radiated pattern and defines the flyability of the system.

1-3. Localizer:

a. Siting. The AN/GRN-30 localizer is sited at the south end of Runway 17/35. The antenna array is situated on a wooden trestle. The elevation of the antennas is just above the crest of the runway overrun, which lies 1000 feet north of the antennas (see page A5-1). Large buildings are located east of the localizer and are oriented parallel to the runway. Although these buildings are not specifically in violation of AN/GRN-29 siting criteria, it is generally accepted that they should not be within 10° of the runway centerline. These buildings are less than 1000 feet from the runway at an angle of about 4° to the localizer centerline. The terrain in the direction of the buildings does not slope up as much as in the direction of the runway. A drawing depicting the building locations is on page A6-1.

b. Evaluation Results. The results of the ground equipment checks indicated, for the most part, the localizer was operating within TO specifications. The phasing of the course and clearance systems of both transmitters was optimized prior to

the flight evaluation. Transmitter two requires additional cable cutting to center the course and clearance sideband phasers. Analysis of the facility siting indicates all antennas do not have line of sight to the threshold. A rise in the ground elevation immediately in front of the antenna array causes a reduced signal strength in the area of the restriction. The flight evaluation revealed that the on-course signal begins a gradual bend outside the middle marker and becomes scalloped as the aircraft flies inbound.

c. Conclusions. Severe scalloping on the localizer crosspointer trace results from reflections off the buildings along the east side of the runway. Siting conditions amplify the reflection problem. The terrain immediately in front of the localizer array rises, causing a reduced signal strength on course. However, the terrain conditions in the direction of the reflections are relatively flat. This means the reflected energy is higher in magnitude than would be the case if the terrain slope were consistent. Excursions on the crosspointer trace do not exceed AFM 55-8 tolerances, but as occurred in the past, slight variations in equipment performance, variations in flight inspection measurement, and position of the large hangar doors on building 3102 will likely result in exceeding these tolerances. The restriction "localizer unusable from middle marker inbound" should remain. An approximate 30% reduction in the severity of the scalloping can be accomplished by widening the course width from 3.3° to 5.0° . This non-tailored course width would be in accordance with AFM 55-8, Change 32, para 217.3206. Other actions involving antenna relocation would require some trial and error, with the cost benefits being questionable.

1-4. Glide Slope:

a. Siting. The glide slope is installed on the east side of the runway 935 feet from the threshold of Runway 17 and 412 feet from the runway centerline. The terrain in the first Fresnel zone is profiled on page A7-1. Some upslope occurs north of Interstate 40, which crosses the approach. A contour study encompassing the first Fresnel zone terrain is presented on page A7-2. Horizon screening for the glide slope is shown on pages A8-4 thru A8-6 and indicates no significant areas of concern.

b. Evaluation Results. With the exception of the width monitor alarm points, the ground equipment checks revealed the facility was operating within TO specifications. A recent change to the TO tightened the width monitor alarm points but the work cards were not changed. Since a disparity existed between the work cards and the TO, the alarm points were adjusted to TO specifications. The siting of the facility was satisfactory for Terminal Instrument Approach Procedures (TERPS) requirements. The flight evaluation indicated the glide slope met AFM 55-8 flight inspection requirements as a Category I facility. A step, at times, was noted above path which made determination of a repeatable path width difficult.

c. Conclusions. The results of the glide slope evaluation indicate the facility can provide satisfactory Category I operation. To obtain Category II operation would require optimizing the antenna offset and modifying the near field terrain to improve the structure in Zone 3.

1-5. Power Systems. The primary and backup power systems of both the localizer and glide slope were checked during the evaluation period. The backup power appeared adequate and reliable. The primary power at the glide slope appeared slightly high and the local maintenance personnel were advised to notify the base CE.

2. RECOMMENDATIONS

2-1. Localizer:

(1) Prior to the next periodic flight inspection, the new cabling for transmitter two should be cut to center the course and clearance sideband phasers.

(2) The 1985th Communications Squadron should explore the operational consequences of increasing the localizer course width to 5.0° .

2-2. Glide Slope. No recommendations.

3. GENERAL INFORMATION

3-1. Primary Using Agencies/Aircraft Supported. The primary using agencies are the 552nd Airborne Warning and Control Systems Wing with E-3A aircraft, and the 507th Tactical Fighter Group with F-4 aircraft. Additionally, there are a large number of transient aircraft of all types, civilian and military transport aircraft, and various aircraft undergoing overhaul by the Oklahoma City Air Logistics Center. An aeronautical chart showing the location of Tinker AFB is on page A1-1.

3-2. Air Traffic Control Facilities. The Air Traffic Control systems supporting the Tinker AFB operation are an AN/FPN-47 radar owned and operated by the FAA, an AN/GRN-19A TACAN, an AN/GRN-27 SSILS serving Runway 35, an AN/GRN-29 SSILS serving Runway 17, and a VFR control tower. The AN/GRN-29 SSILS provides Category I instrument approaches to Runway 17. These procedures are outlined on pages A2-1 and A2-2.

3-3. Terminal Instrument Approach Procedures. Information concerning the TERPS are contained in the facility data sheets on pages A3-1 thru A3-4. The method used to calculate the TCH, GPI, and RPI are shown on page A4-1. These calculations are based on a rapid decrease in elevation toward the runway.

4. ANALYSIS OF EVALUATION RESULTS

4-1. Localizer:

a. Ground Equipment Checks. The results of the localizer initial performance and subsystem checks are on pages A9-1 thru A10-4. A record of the ground checks accomplished during the evaluation is on pages A11-1 and A11-2. Graphs of the ground checks are on pages A12-1 thru A12-8.

(1) Course Phasing. The course phasing of both transmitters was less than optimum. The phasing was adjusted at the far field 3° phasing points for as close to 0 DDM as possible, balanced between the 90 Hz and 150 Hz sides. Following this adjustment, the sideband phasers indicated 10° and 20° delay, respectively, for transmitters one and two. To center the phaser on transmitter one, two inches was cut from the C+SB cable (6W29) at the distribution unit. The phaser for transmitter two now indicated 10° delay while transmitter one was approximately 0° . To center the phaser on transmitter two, a longer transmitter SBO cable is required. This was not accomplished during the evaluation because the cable and connectors were unavailable. The local maintenance personnel should fabricate and install a longer SBO cable prior to the next periodic flight inspection.

(2) Clearance Phasing. The clearance phasing of both transmitters was significantly less than optimum (see pages A12-3 and A12-4). To center the phaser of transmitter one, eight inches was cut from the SBO cable (6W32) at the distribution unit. The sideband phaser of transmitter two was still about 10° advanced and will require a longer C+SB transmitter cable. The fabrication and installation of this cable should be done in conjunction with the course cable. Final results of the clearance phasing can be seen on pages A12-5 and A12-6.

(3) Antenna Nulls. Some difficulty was encountered in determining the placement of the antenna RF nulls. Several methods were employed during the evaluation.

(a) TO Procedures. The single tone DDM method was attempted using the GRM-112 Portable ILS Receiver (PIR) with little success. A dip in the DDM indication could be seen for pairs six and seven, but no change for any other pair.

(b) RF Null. The traditional method of determining the null placement is to find the RF minimum. This was attempted using the GRM-112 PIR, again with little success. The meter sensitivity of the GRM-112 makes it extremely difficult to see an RF dip. The RF level meter indication from 10 to 50 represents signal strengths from -80 dBm to +10 dBm with a nonlinear response. The RF minimum was only one meter movement division or less. Where no dip was observed, an attempt was made to measure the null using the bracket method. The PIR was moved until the meter movement increased to some reference level. The PIR was then moved to the other side of the runway centerline until the same reference level was found. One half the distance between these two locations was considered the null position. Displacement was calculated by measuring from this point to the runway centerline. The results of the RF null checks are on page A10-1.

(c) Null Stacking. SCA Engineering used a method called null stacking in March 1979. They recommended all future null placements required at Tinker AFB be accomplished using this method. Pair seven is radiated separately, both C+SB and SBO, and the null adjusted to 0 DDM using the far field monitor indication. Pair six is then added and its cabling adjusted for a combined reading of 0 DDM. This process is repeated for each antenna pair until all seven pairs are radiating. The local maintenance personnel used this method following the replacement of the distribution unit in June 1980. During the TRACALS Evaluation, this procedure was followed but no adjustments were made. The DDM on centerline and the distance to the DDM null were also recorded at the 1000 feet ground check point (see page A10-4). This test indicated pairs seven, four, and probably three could all be further adjusted. Positioning the null to centerline would not have significantly improved the overall course signal and no action was taken by the TRACALS team.

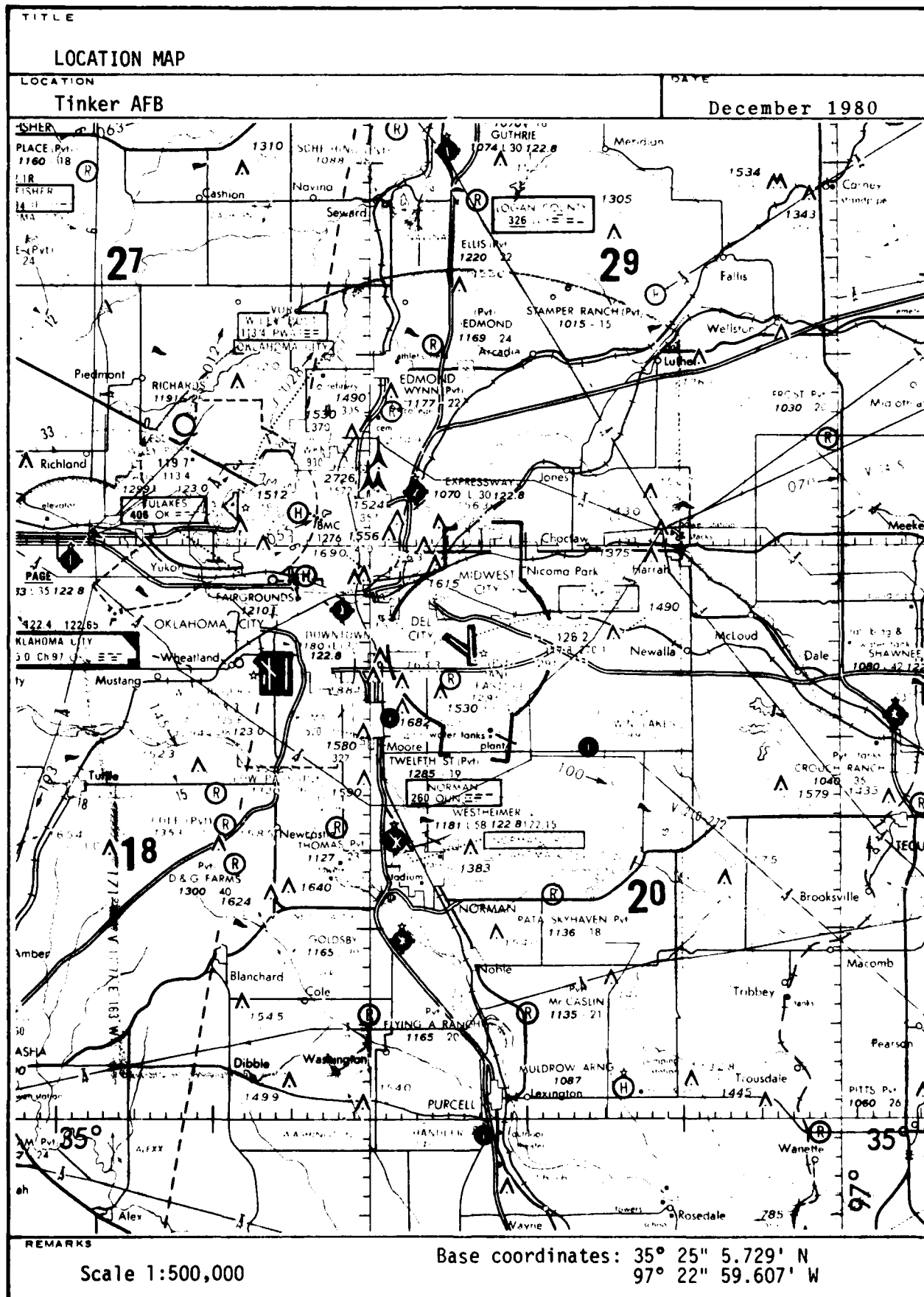
b. Flight Evaluation. Severe scalloping on the localizer crosspointer trace (see page A18-9) results from reflections from buildings along the east side of the runway. Sideband energy transmitted from the antenna array strikes the flat vertical surfaces of these buildings and is reflected at an angle equal to the incident angle. This energy results in sideband energy being present where a sideband null should exist on centerline, approximately in the area from 1 NM beyond the middle marker to touchdown. This energy, depending on the path length, adds in phase or out of phase to the C+SB component to produce an alternating condition of predominating 90 Hz or 150 Hz, resulting in scalloping. The terrain conditions amplify the reflection problem. The

terrain immediately in front of the localizer array rises, which causes a reduced signal strength on course. In fact, the Runway 17 threshold is approximately 30 feet below line of sight from the localizer. However, the terrain is relatively flat in the direction of the buildings that cause the reflections. This means that the energy from the reflective surfaces that combines with the direct energy on course is higher in magnitude than would be the case if no upslope existed.

4-2. Glide Slope:

a. Ground Equipment Checks. With the exception of the width monitor alarm points, the ground equipment checks indicated the facility was operating within TO specifications. Change 3 to TO 31R4-2GRN31-2 changed the width alarm points from 0.145 DDM to 0.155 DDM and 0.205 DDM to 0.195 DDM. This change was required because some facilities were having difficulty meeting the advance and retard to alarm tolerance during flight checks. The workcards, TO 31R4-2GRN-6WC-1, have not been changed to reflect the new alarm points. Since a conflict exists between the TO and the workcards, the TO tolerances were applied during the evaluation. The local maintenance personnel should submit an AFTO Form 22 to correct this discrepancy.

b. Flight Evaluation. No significant glide slope performance deficiencies were detected. A fly down indication was noted from Point B to threshold. Terrain in the first Fresnel zone (see page A20-1) is the probable cause. As the aircraft approaches the threshold and the Fresnel zone swings in that direction and shortens, the terrain that develops the glide angle slopes downward more rapidly which results in driving the glide angle down. The deviation in phasing is probably also caused by the same terrain condition. That could be corrected by adjusting the antenna offset. It was not considered necessary since the deviation is inside Point B. The facility was evaluated with the theodolite positioned in line with the RPI and an elevation angle of 2.5° . The straight line structure (except for the fly-down indication in close) indicates the facility is properly sited and aligned to meet the 45.4 feet TCH.



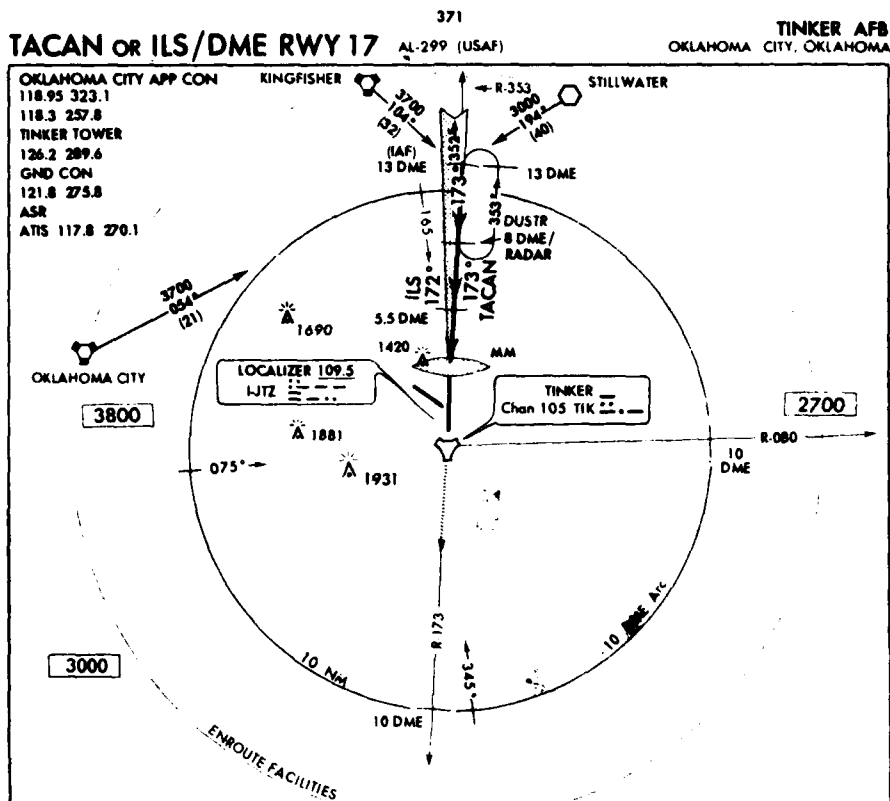
INSTRUMENT APPROACH PROCEDURES

LOCATION

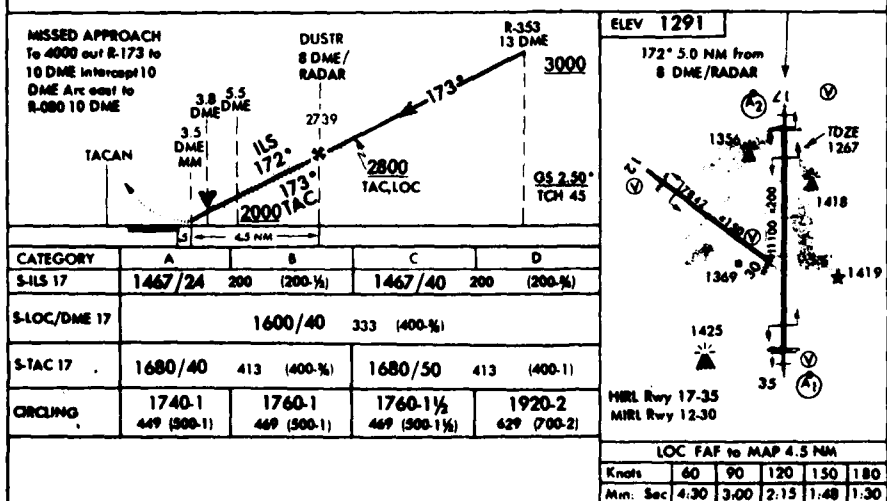
Tinker AFB

DATE _____

December 1980



NOTE: Localizer unusable from MM inbound



TACAN OR ILS/DME RWY 17 35°25'N-97°23'W

371

OKLAHOMA CITY, OKLAHOMA
TINKER AFB

REMARKS

TITLE:

INSTRUMENT APPROACH PROCEDURES

LOCATION

Tinker AFB

DATE

December 1980

HI-TACAN or ILS/DME RWY 17

165
JAL-299 (USAF)TINKER AFB
OKLAHOMA CITY, OKLAHOMA

OKLAHOMA CITY APP CON
118.95 323.1
118.3 257.8
TINKER TOWER
126.2 289.6
GND CON
121.8 275.8
ASR
ATIS 117.8 270.1

OKLAHOMA CITY
115.0 OKC
Chan 97

LOCALIZER 109.5
IJTZ

TINKER
Chan 105 TIK

HIGH ALTITUDE FACILITIES

NOTE: Localizer unusable
from MM inbound.

EMERG SAFE ALT 100 NM 3800

MIN SAFE ALT 25 NM 3800

MISSED APPROACH
To 4000 out R-173 to
10 DME intercept

10 DME Arc east to
R-080 10 DME

DISTR
OKC R-067
8 DME/RADAR

ILS 172°
173°
3000 TAC

GS 2.5°
TCH 45

Intcp
Larr
R-353

CAMIO
R-025 16 DME

8000

LOC 109.5
IJTZ

173° 5.0 NM
from 8 DME

1356

1369°

1425

1418

1419

1425

1418

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1425

HI-TACAN or ILS/DME RWY 17 35° 25' N-97° 25' W

165

OKLAHOMA CITY, OKLAHOMA
TINKER AFB

REMARKS

FACILITY DATA

I. AIRPORT					
1. AIRPORT (City) or AFB, State or Country Tinker AFB, Oklahoma		2. ICAO IDENT KTIK		3. MAG VARIATION 8°E (1975)	
5. OPERATING AGENCY 1985 Comm SQ AV 735-5232 Tinker AFB, OK 73145		6. OWNER USAF		7. FIELD ELEVATION (MSL) 1291	
4. AIRPORT REFERENCE POINT (City, State, Country) Minutes, Seconds to nearest hundredth LATITUDE 35-25-05.73N LONGITUDE 97-22-59.61W					
II. GENERAL					
8. TYPE FACILITY LOCALIZER		9. FREQ/CHANNEL 109.5		10. IDENTIFICATION I-JTZ	
11. CLASS/CATEGORY CAT I		12. COMMON SYSTEM YES NO		13. DATE COMMISSIONED 060179	
14. EQUIPMENT TYPE AN-30		15. TYPE ANTENNA OE-271/G		16. SITE ELEVATION (MSL) 1281.46	
17. ANTENNA HEIGHT (FT AG) 17		18. CONTROL STATION AND FREQUENCY 229.6 126.2		19. MONITOR YES NO	
20. PRIMARY POWER ENGINE		21. STANDBY POWER ENGINE		22. STANDBY EQUIP YES NO	
23. ANTENNA LOCATION (City, State, Country) LATITUDE 35-23-43.995N LONGITUDE 97-22-54.5365W		24. MAG VARIATION 08°E		25. MONITOR RADIAL NA	
26. RUNWAY NUMBER 17		27. ILS, PAR, RUNWAY TRUE BEARING 180.21°		28. POWER OUTPUT 15 Watts	
29. RUNWAY DIMENSIONS LENGTH 11100.84 FEET WIDTH 200 FEET		30. DISPLACED THRESHOLD YES NO		31. COMMISSIONED DATE 3-30-70 ANGLE NA	
32. THRESHOLD ELEVATION (MSL) 1260.95		33. ICH FT (AG) 45.4		34. ILS, PAR, VASI ANGLE COINCIDENCE ILS (°) 2.5 VASI (°) 2.5	
35. ASR VERTICAL COVERAGE RADIAL AND OPERATIONAL REQUIREMENT RADIAL DISTANCE ALTITUDE 11A		36. RESTRICTED YES NO			
III. LOCALIZER AND SDF DATA					
37. DISTANCE TO TOWER NM 7.30 FEET 124870.84		38. DISTANCE TO M.M. NM 2.55 FEET 15514.94		39. DISTANCE TO C/L RUNWAY ABREAM GLIDE PATH ANTENNA (Feet) 11196.53	
40. DISTANCE TO THRESHOLD 12150		41. DISTANCE TO STOP END RWY 1050		42. DIRECTION (Right or Left) AND DISTANCE LOC OFFSET FROM RUNWAY C/L On Center Line	
43. LOCALIZER COURSE TAILORED YES NO		44. BACK COURSE USABLE DISTANCE NA NM AT 1 NA FT (MSL/MRA)		45. OFFSET LOC TRUE BEARING NA	
46. WIDTH AT THRESHOLD (Feet) 780		47. INKR WIDTH (Feet) NA		48. BACK COURSE TRUE BEARING NA	
49. FRONT COURSE CHECK POINT SDME TIK TACAN		50. BACK COURSE CHECK POINT NA			
IV. GLIDE PATH DATA (ILS/PAR/VASI)					
51. DISTANCE TO O.M. (NM) (Feet)		52. DISTANCE TO M.M. (NM) (Feet)		53. DISTANCE TO I.M. (NM) (Feet)	
54. DISTANCE TO POINT "C" (NM) (Feet)		55. DISTANCE TO THRESHOLD (Feet) (NM) (Feet)		56. RUNWAY ELEV ABREAM G/S ANT (MSL)	
57. DIRECTION (Right or Left) AND DISTANCE FROM ANTENNA TO RUNWAY C/L		58. ELEVATION TO ZONE (MSL)		59. DISTANCE - THRESHOLD TO GPI ILS (Feet) PAR (Feet) VASI (Feet)	
60. ALTITUDE OVER O.M. OR CK. PT. (Feet) TAPELINE E.C. MSL		61. ALTITUDE OVER M.M. TAPELINE E.C. MSL		62. ALTITUDE OVER I.M. TAPELINE MSL	
63. DISTANCE O.M. TO THRESHOLD (Feet)		64. DISTANCE M.M. TO THRESHOLD (Feet)		65. TYPE APPROACH LIGHTING	
66. TYPE RUNWAY LIGHTING		67. GLIDE PATH MONITOR ANGLE (High) ANGLE (Low)			

FACILITY DATA

I. AIRPORT					
1. AIRPORT (City or AFB, State or Country)		2. ICAO IDENT	3. MAG VARIATION	4. AIRPORT REFERENCE POINT 1. Time, Minutes, Seconds-to nearest hundredth	
Tinker AFB, Oklahoma		KTIK	8°E(1975)		
5. OPERATING AGENCY		6. OWNER	7. FIELD ELEVATION (MSL)	LATITUDE	
1985 COMM SQ AV 735-5232		USAF	1291.23	35-25-05.73N	
Tinker AFB OK 73145				LONGITUDE 97-22-59.61W	
II. GENERAL					
8. TYPE FACILITY	9. FREQ/CHANNEL	10. IDENTIFICATION	11. CLASS/CATEGORY	12. COMMON SYSTEM	13. DATE COMMISSIONED
GLIDESLOPE	332.6	I-JTZ	CAT I	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	060179
14. EQUIPMENT TYPE	15. TYPE ANTENNA	16. SITE ELEVATION (MSL)	17. ANTENNA HEIGHT (FT AG)	18. CONTROL STATION AND FREQUENCY	
AN/SPN-31	AS-3229/G	1264.74	30.33	Tinker Tower	
19. ANTENNA LOCATION (Degrees, Minutes, Seconds)		20. PRIMARY POWER	21. STANDBY POWER	22. STANDBY EQUIP	23. MONITOR
35-25-34.7285N		<input checked="" type="checkbox"/> COMMERCIAL	<input checked="" type="checkbox"/> ENGINE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
97-22-49.058		<input type="checkbox"/> ENGINE	<input type="checkbox"/> COMMERCIAL		<input type="checkbox"/> SINGLE <input type="checkbox"/> DUAL
		<input type="checkbox"/> NONE			
24. RUNWAY NUMBER	25. ILS/FAR/RUNWAY TRUE BEARING	26. MAG VARIATION	27. VOICE	28. MONITOR RADIAL	29. POWER OUTPUT
17	180.21°	NA	NO	NA	4 Watts
30. RUNWAY DIMENSIONS		31. DISPLACED THRESHOLD	32. COMMISSIONED	33. ASR VERTICAL COVERAGE RADIAL AND OPERATIONAL REQUIREMENT	
LENGTH 11100.84 FEET		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	WIDTH .72°	RADIAL DISTANCE	
WIDTH 200 FEET			ANGLE 2.5°	ALTITUDE NA	
34. THRESHOLD ELEVATION (MSL)	35. TCH FT AG	36. ILS/FAR/VASI ANGLE COINCIDENCE		37. RESTRICTED	
1260.95	45.4	2.5		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
III. LOCALIZER AND SDF DATA					
38. DISTANCE TO C/M (NM)	39. DISTANCE TO M/M (NM)	40. DISTANCE TO C/L RUNWAY AREA (Feet)		41. DIRECTION (Right or Left) AND DISTANCE LOC OFFSET FROM RUNWAY C/L	
(FEET)	(FEET)				
42. DISTANCE TO THRESHOLD	43. DISTANCE TO STOP END RWY	44. USABLE DISTANCE		45. CH SET LOC TRUE BEARING	
		NM AT FT (MSL/MAA)		46. LOC CW MONITOR	
		NM AT FT (MSL/MRA)		WIDE	
47. LOCALIZER COURSE TAILORED		48. BACK COURSE USABLE DISTANCE		49. BACK COURSE TRUE BEARING	
<input type="checkbox"/> YES <input type="checkbox"/> NO		NM AT FT (MSL/MAA)		50. OMKR WIDTH (Feet)	
WIDTH AT THRESHOLD (Feet)		NM AT FT (MSL/MRA)			
51. OMKR WIDTH (Feet)	52. OMKR WIDTH (Feet)	53. FRONT COURSE CHECK POINT		54. BACK COURSE CHECK POINT	
IV. GLIDE PATH DATA (ILS/FAR/VASI)					
55. DISTANCE TO TCH (Feet)	56. DISTANCE TO M/M (Feet)	57. DISTANCE TO I.M. (Feet)	58. DISTANCE TO POINT "C" (Feet)	59. DISTANCE TO THRESHOLD (Feet)	60. RUNWAY FLEV AREA M/G/S ANT (MSL)
5.46	.71	NA	.36	.16	1263.70
(Feet) 23173.1	(Feet) 4318.04	(Feet) NA	(Feet) 2203.57	(Feet) 953.1	
61. DIRECTION (Right or Left) AND DISTANCE FROM ANTENNA TO RUNWAY C/L		62. ELEVATION TO ZONE (MSL)		63. DISTANCE - THRESHOLD TO GPI	
Left 412.5		1267		ILS (Feet) GPI 1039.91	
				FAR (Feet) RPI 975.44	
64. ALTITUDE OVER O.M. OR CK. PT. (Feet)		65. ALTITUDE OVER M.M.		66. ALTITUDE OVER I.M.	
TAPELINE	E.C.	TAPELINE	E.C.	TAPELINE	MSL
1448.37	26.32	188.53	.45	NA	NA
	2739.43		1453.72		
67. DISTANCE O.M. TO THRESHOLD (Feet)	68. DISTANCE M.M. TO THRESHOLD (Feet)	69. TYPE APPROACH LIGHTING	70. TYPE RUNWAY LIGHTING	71. GLIDE PATH MONITOR	
32220	3364.94	SSALS A2	HIRL	ANGLE (High) 2.69	
				ANGLE (Low) 2.31	

A3-4

Sale No. 690: 1872-1911; 153; 1st Apr.

TITLE:

TERPS CALCULATIONS

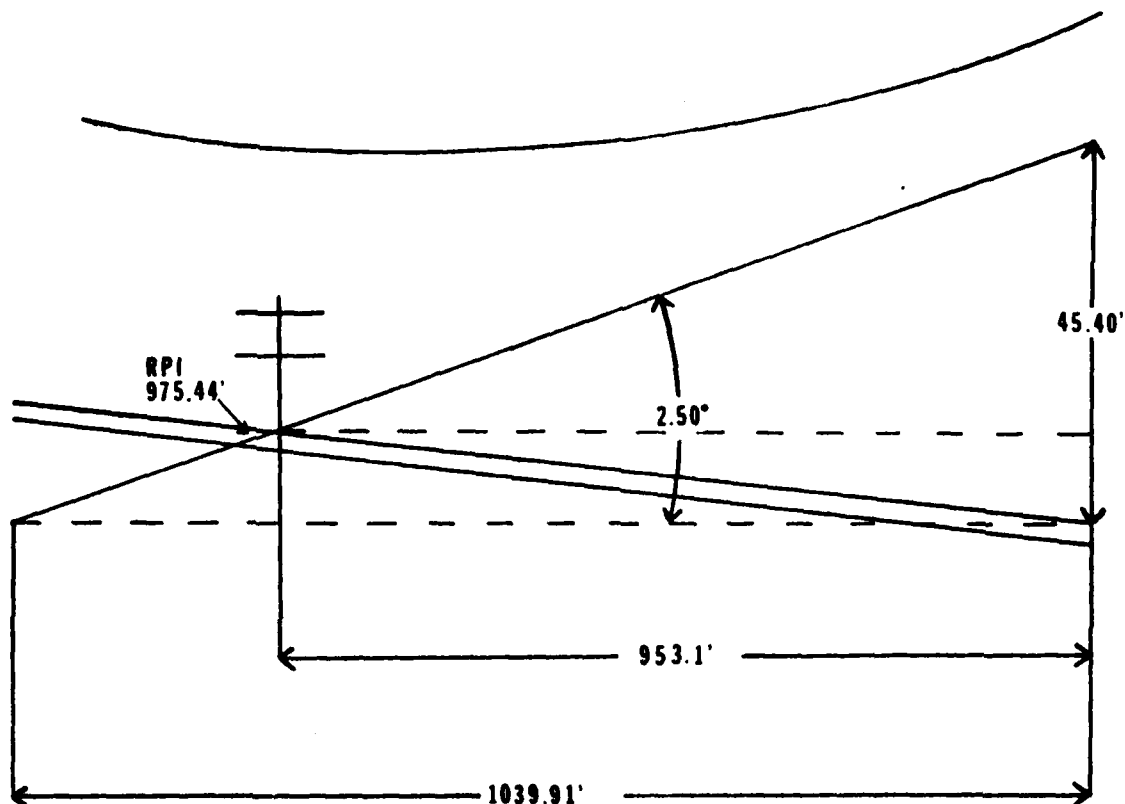
LOCATION

Tinker AFB

DATE

December 1980

RAPIDLY DROPPING TERRAIN



$$\begin{aligned} TCH &= (\tan GS)(\text{DIST ANT TO TH}) - (\text{TH EL-ANT EL}) \\ &= (.044)(953.1) - (1260.95 - 1264.74) \\ &= 45.40' \end{aligned}$$

$$\begin{aligned} GPI &= TCH / \tan GS \\ &= 45.40 / .044 \\ &= 1039.91' \end{aligned}$$

$$\begin{aligned} RPI &= (TCH)(\text{DIST ANT TO TH}) / TCH + (\text{RWY CRWN EL-ANT EL}) \\ &= (45.40)(953.1) / (45.40 + (1263.70 - 1264.74)) \\ &= 975.44' \end{aligned}$$

REMARKS

TITLE:

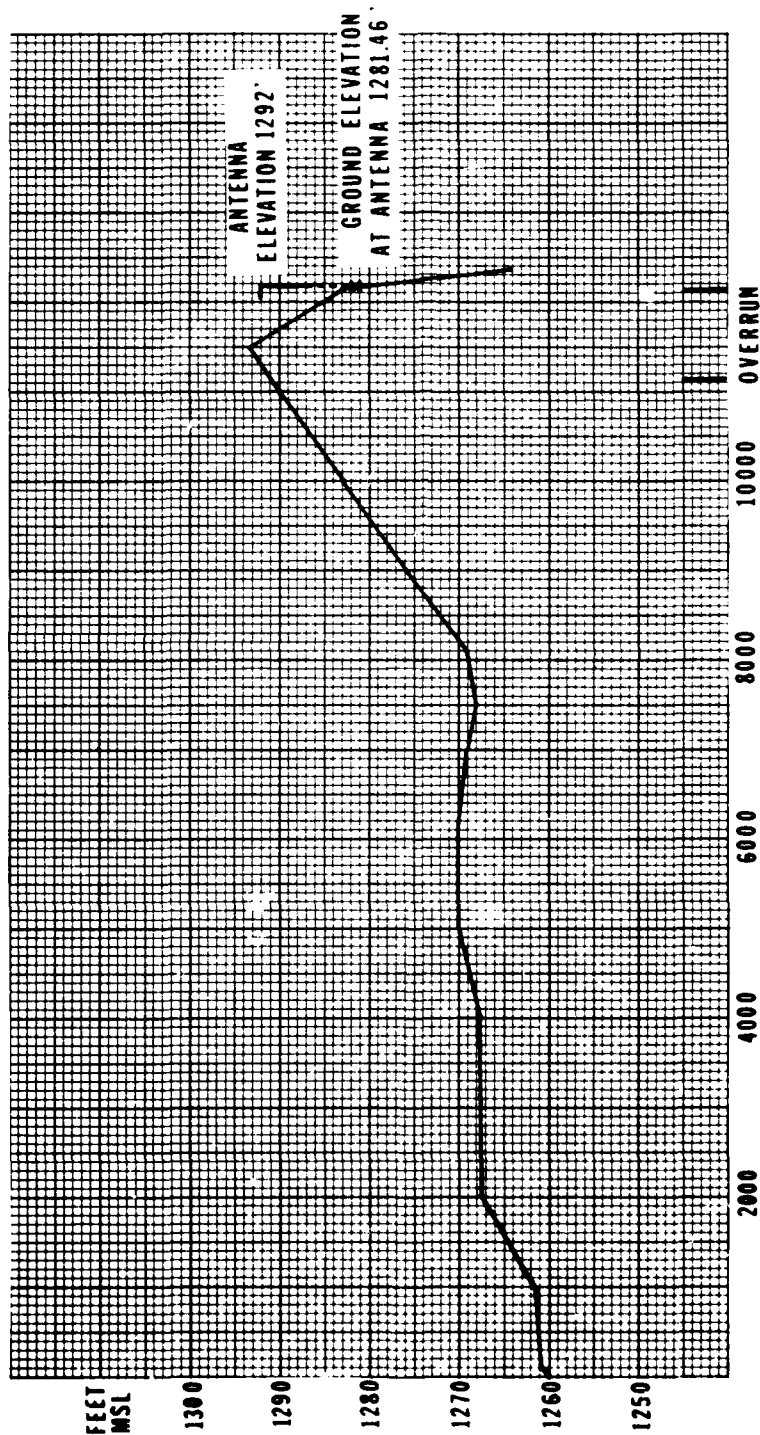
RUNWAY CONTOUR

LOCATION

Tinker AFB

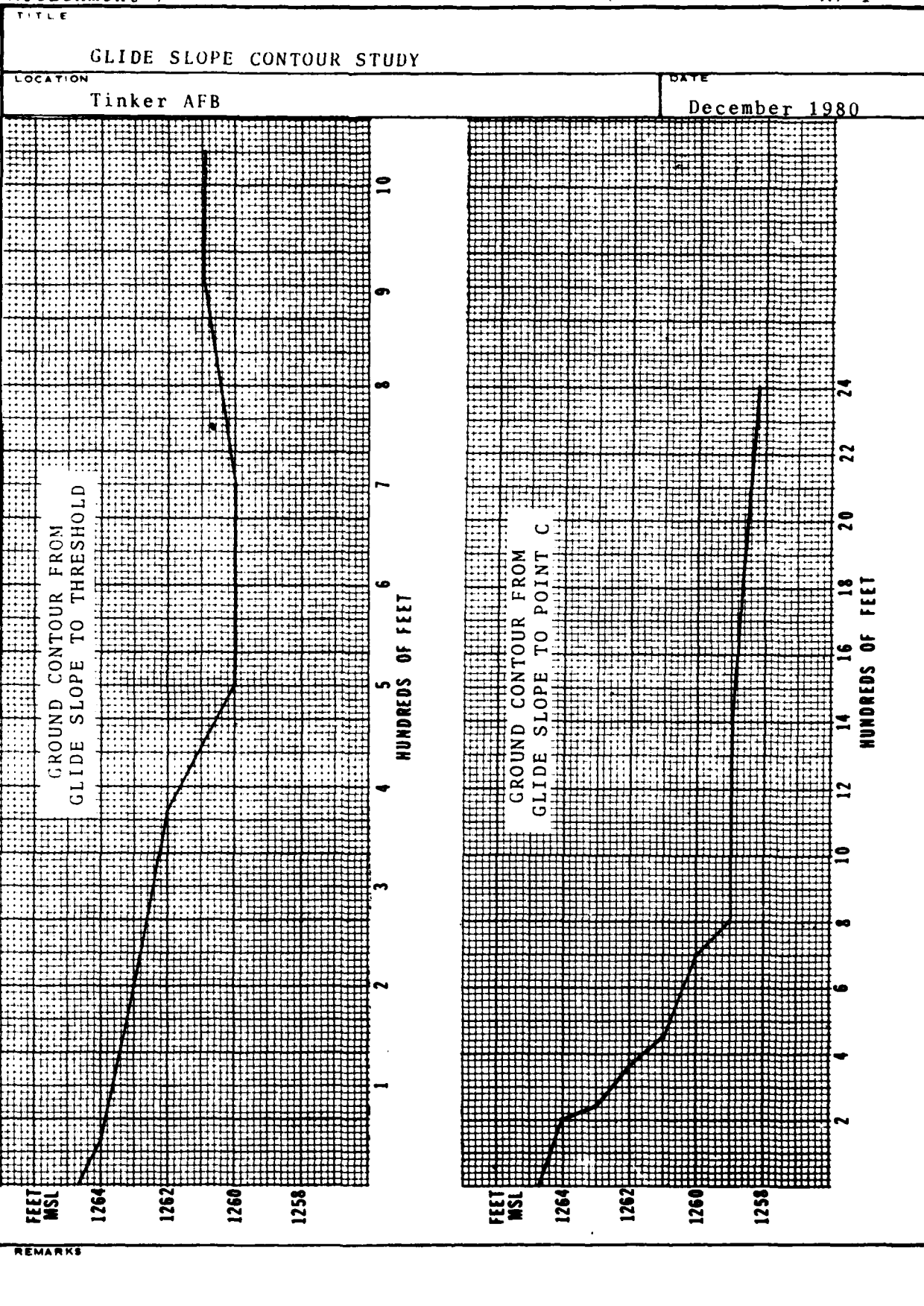
DATE

December 1980



TITLE: RUNWAY AND BUILDING LAYOUT	
LOCATION: Tinker AFB	DATE: December 1980

The diagram shows a vertical runway with a 'MIDDLE MARKER' indicated by a cross symbol. To the right of the runway are three buildings labeled 3102, 3105, and 3001. At the bottom of the runway is a 'LOCALIZER ARRAY' indicated by a series of arrows. A scale of 1" = 2000' is shown in the bottom right corner of the diagram area.



TITLE

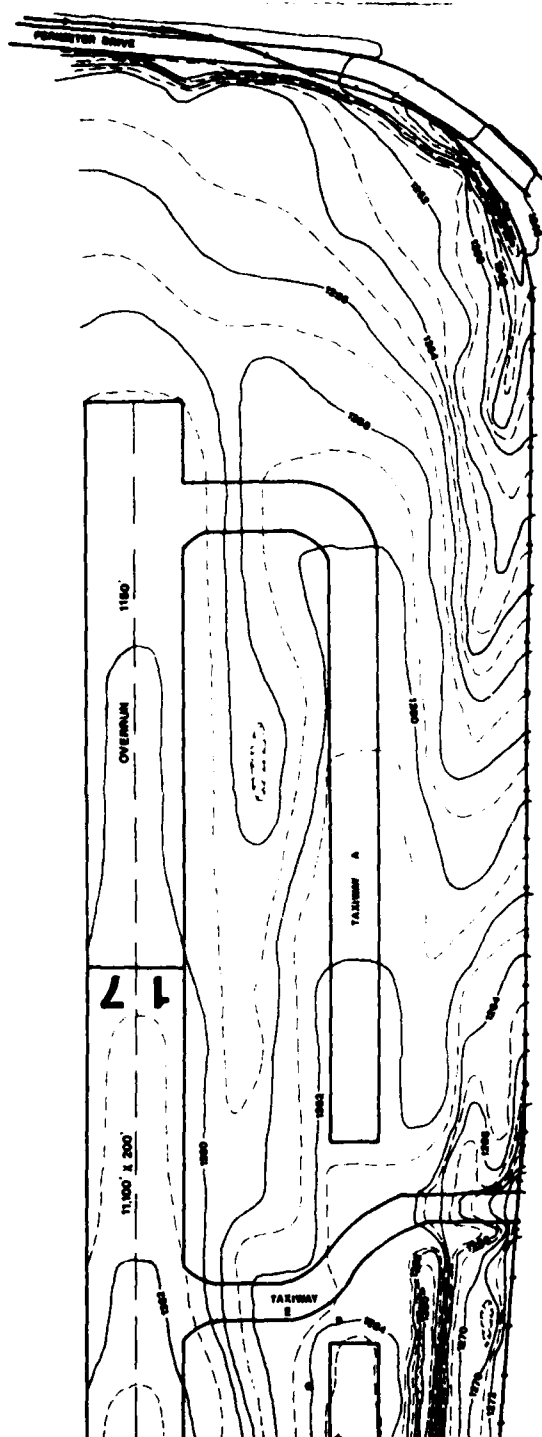
GLIDE SLOPE CONTOUR STUDY

LOCATION

Tinker AFB

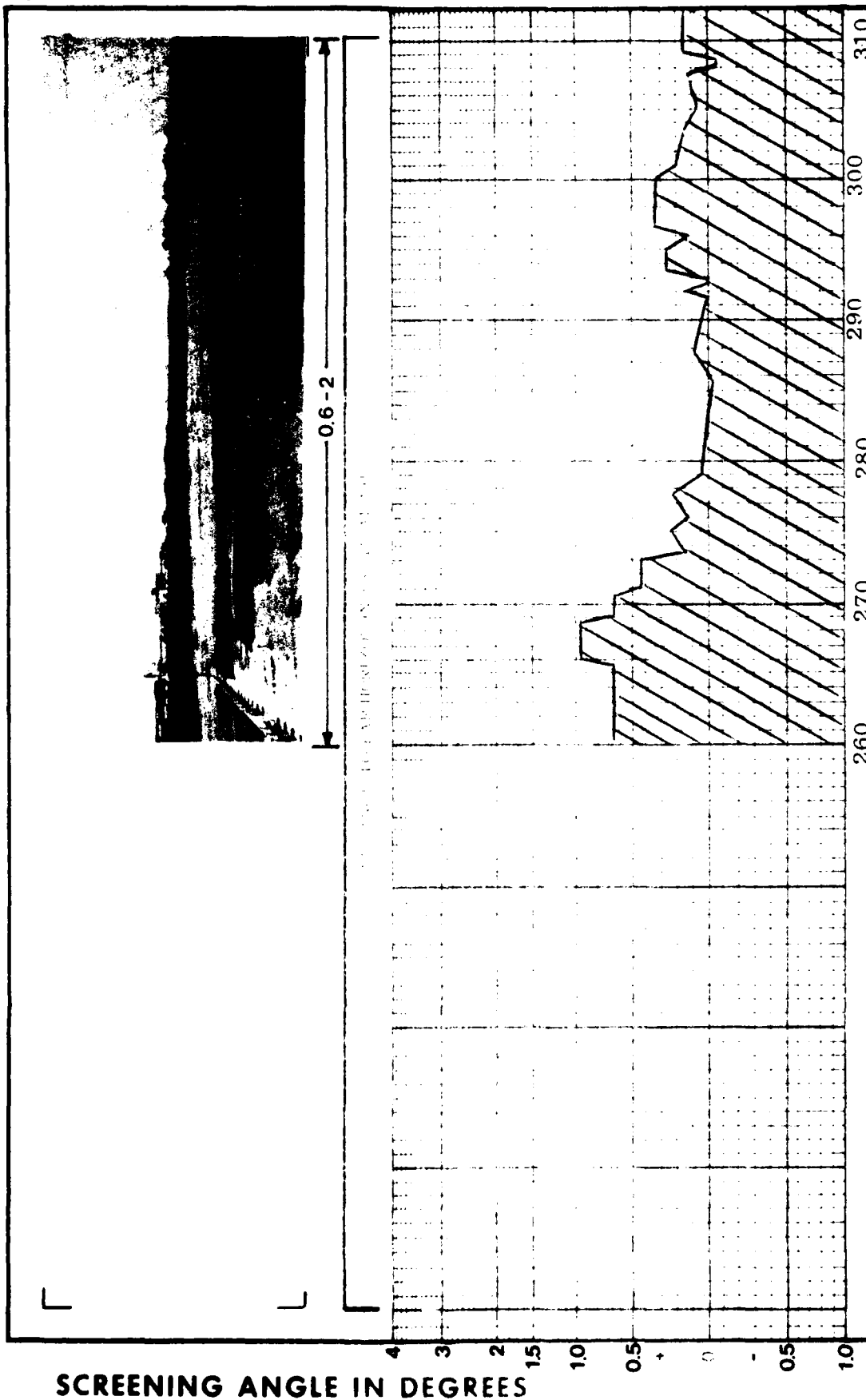
DATE

21 July 1978



REMARKS

SKYLINE GRAPH

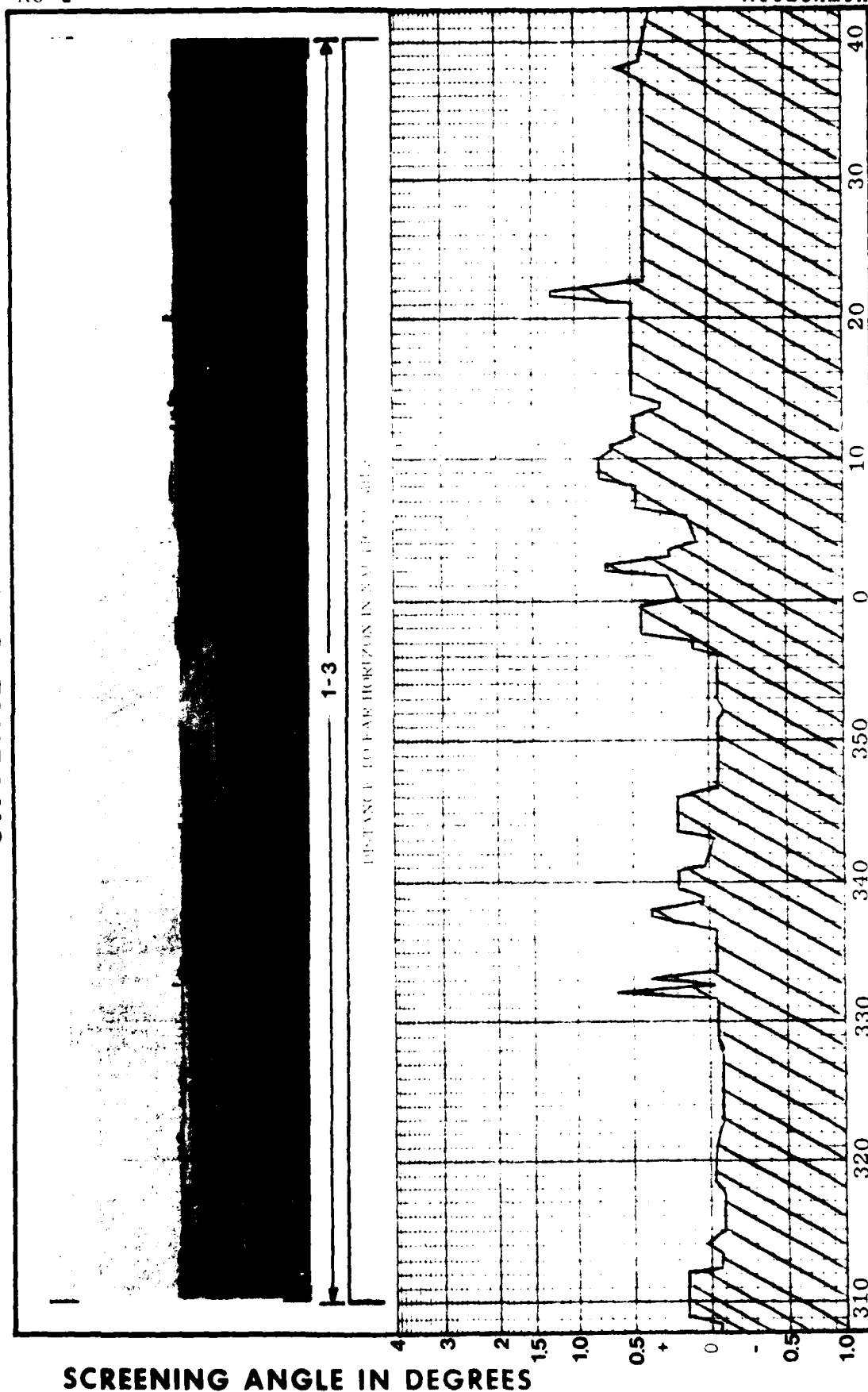


STATION TINKER AFB, OK
EQUIPMENT LOCALIZER

ORIENTED TO: MAGNETIC NORTH

AFC5 11 9'3

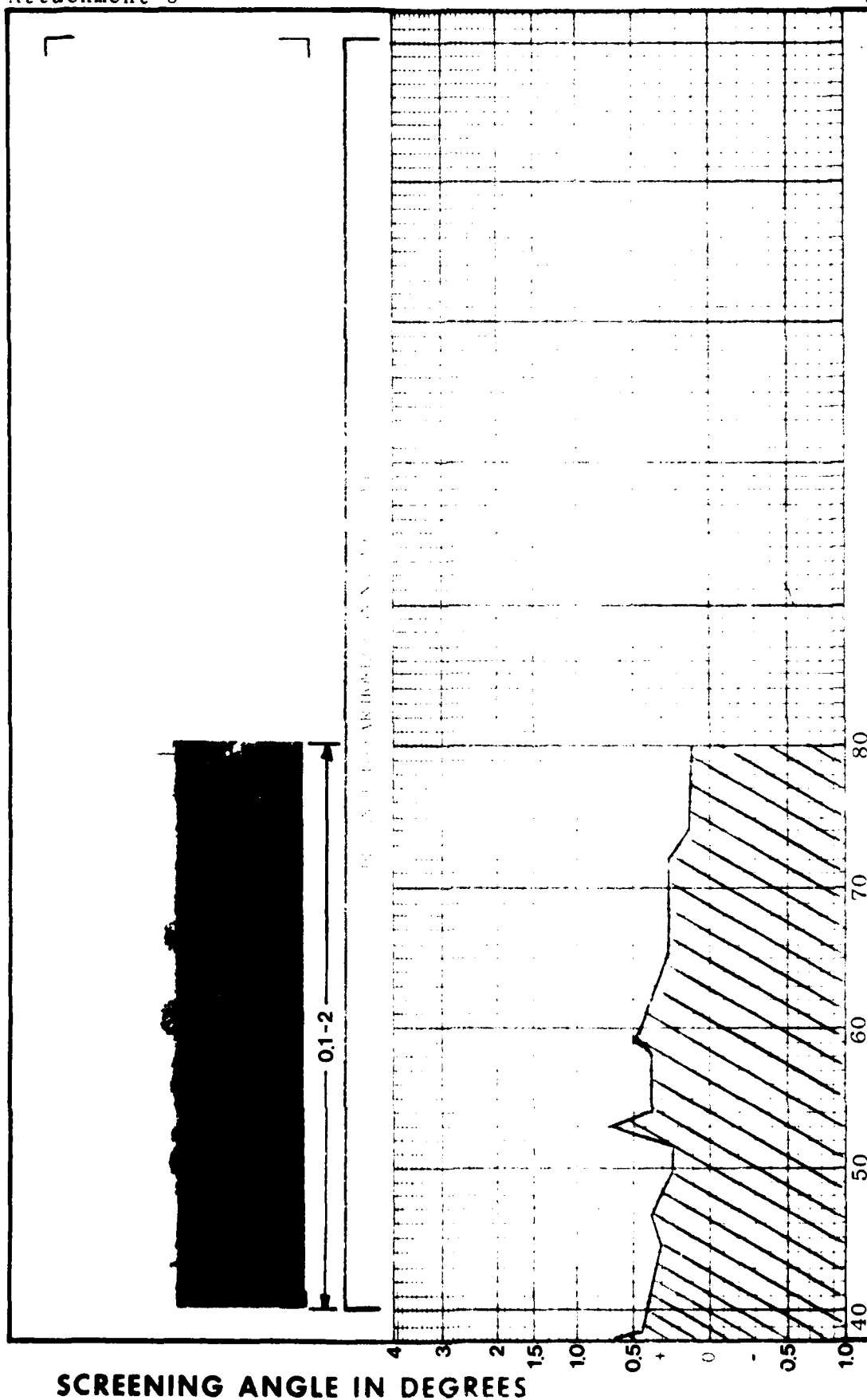
SKYLINE GRAPH



STATION TINKER AFB, OK
EQUIPMENT LOCALIZER

ORIENTED TO: MAGNETIC NORTH

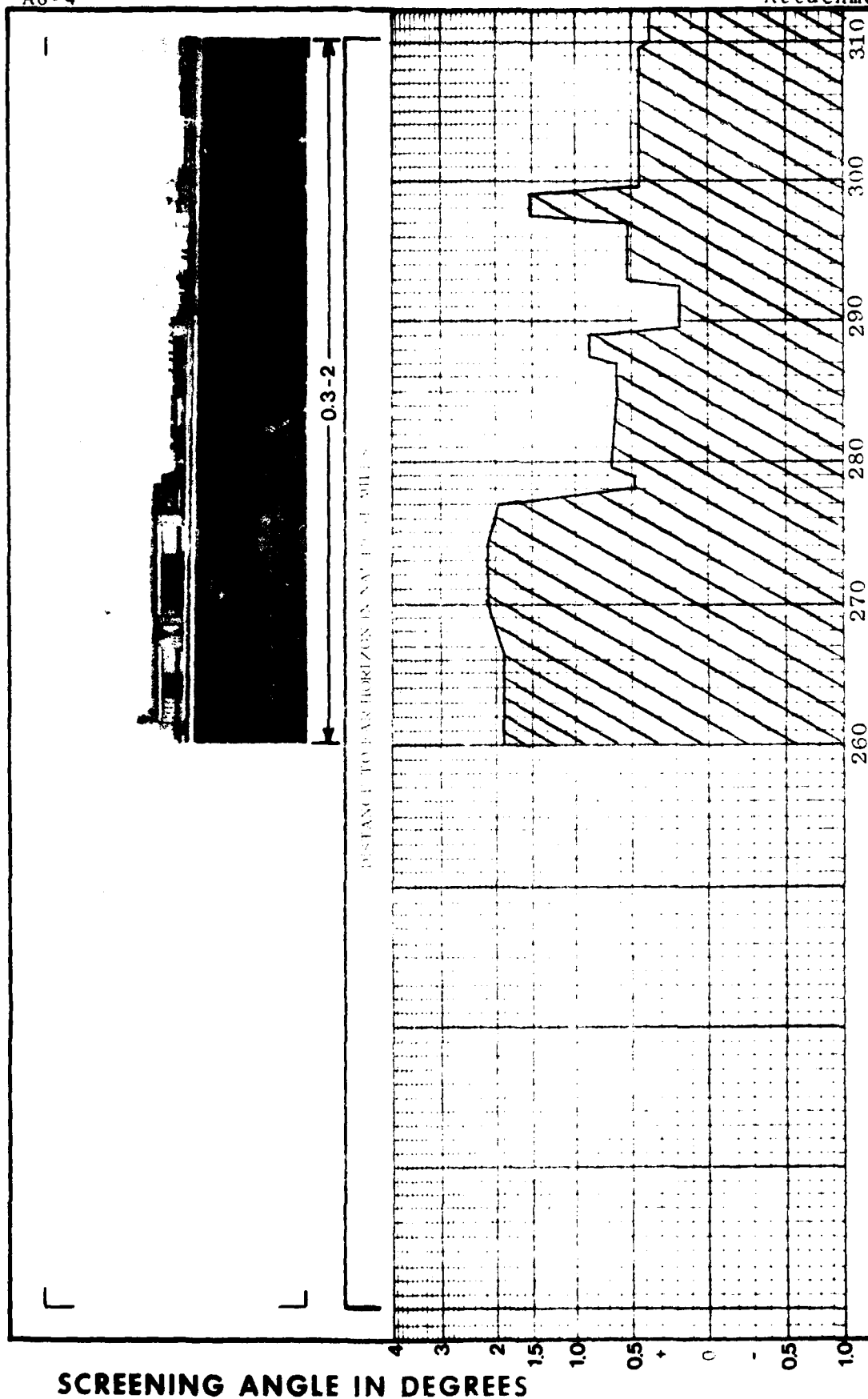
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STATION TINKER AFB, OK
EQUIPMENT LOCALIZER

ORIENTED TO: MAGNETIC NORTH

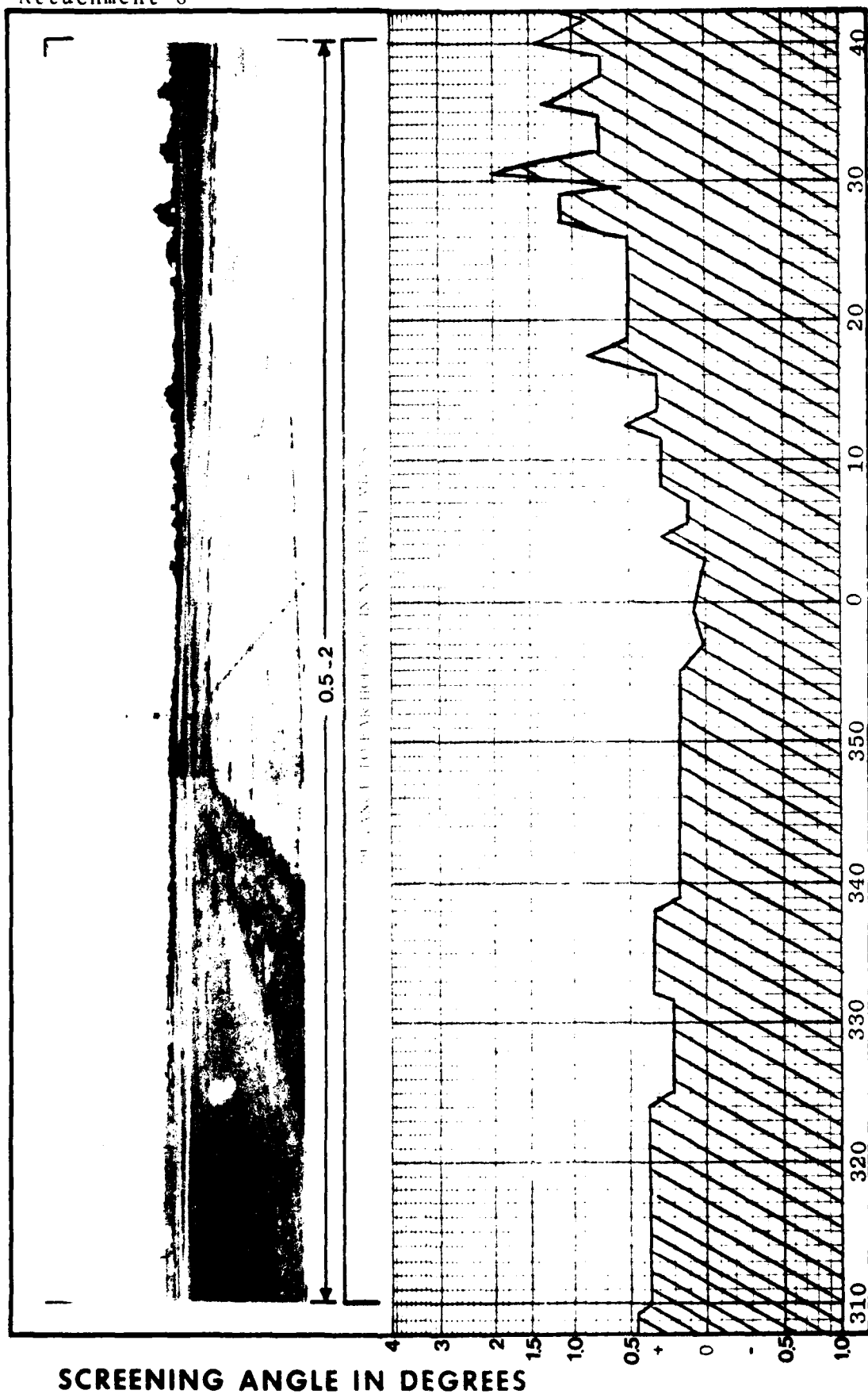
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ORIENTED TO: MAGNETIC NORTH

STATION TINKER AFB, OK
EQUIPMENT GLIDE SLOPE

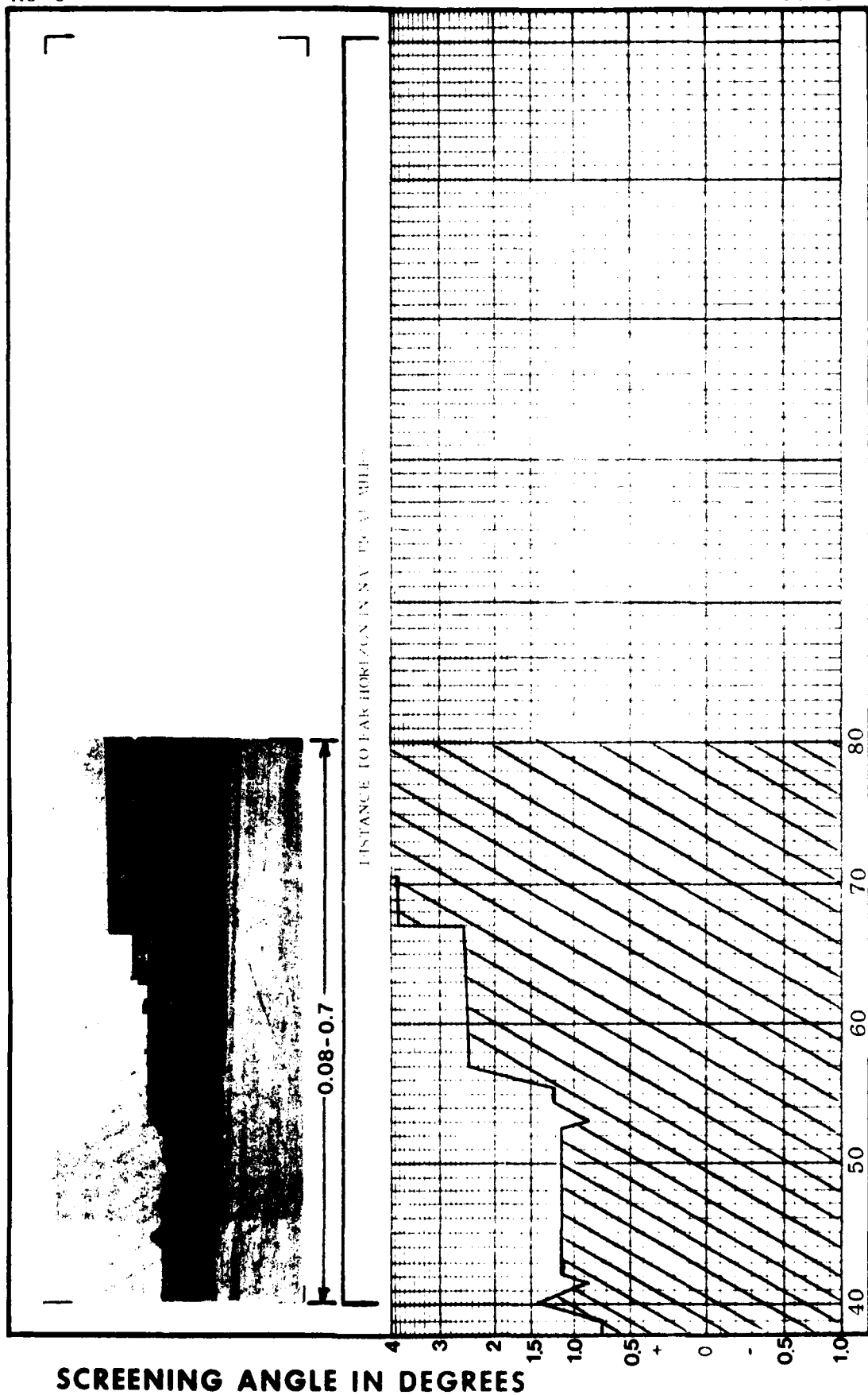
SKYLINE GRAPH



ORIENTED TO: MAGNETIC NORTH

STATION TINKER AFB, OK
EQUIPMENT GLIDE SLOPE

SKYLINE GRAPH



STATION TINKER AFB, OK
EQUIPMENT GLIDE SLOPE

ORIENTED TO: MAGNETIC NORTH

SSILS LOCALIZER INITIAL PERFORMANCE CHECKLIST						DATE 8 December 1980
LOCATION Tinker AFB, OK		EQUIPMENT AND SERIAL NUMBER AN/GRN-30 SN: 77007				TECHNICIAN Mr. Conley MSgt Thibodeau
CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	ADJUSTED	INITIAL	ADJUSTED	
COURSE CARRIER POWER	SAME AS LAST FLIGHT CHECK	14W	15W	14.8W	15W	
COURSE SIDEBAND POWER	SAME AS LAST FLIGHT CHECK	290mW	310mW	285mW	310mW	
CLEARANCE CARRIER POWER	SAME AS LAST FLIGHT CHECK	3.25W	4W	3.3W	4W	
CLEARANCE SIDEBAND POWER	SAME AS LAST FLIGHT CHECK	150mW	142mW	150mW	142mW	
COURSE MODULATION	+4% OF LAST FC	37.5%	40%	37.5%	40%	
90HZ MODULATION	+2% OF LAST FC	20%		21.2%		
150HZ MODULATION	+2% OF LAST FC	20%		21.2%		
CLEARANCE MOD	+4% OF LAST FC	37.5%	42.5%	40%	42.5%	
90HZ MODULATION	+2% OF LAST FC	20%		21.2%		
150HZ MODULATION	+2% OF LAST FC	20%		20%		
COURSE POWER SUPPLY 1						
Q5 DC OUT	0.75 TO 3.5A	1.76		1.9		
Q4 DC OUT	0.75 TO 3.5A	1.8		2.0		
DC OUT	26.5 TO 29.5 V	28.8		28.5		
PRE REG	30 TO 38V	35.5		39.2		
COURSE POWER SUPPLY 2						
Q9 DC OUT	0.75 TO 3.5A	1.88		2.1		
Q10 DC OUT	0.75 TO 3.5A	1.8		2.0		
DC OUT	26.5 TO 29.5V	28.8		28.5		
PRE REG	30 TO 38V	35.5		35.2		
COURSE TRANSMITTER						
OSC TUNE	0.5 MIN	1.11		1.2		
EXCTR OUTPUT	0.85 TO 3.0	1.43		2.06		
CSB PA	1.0 TO 3.25	2.32		2.21		
SBO PA	0.75 TO 1.95	1.32		1.4		
CSB PWR OUT	0.50 TO 2.0	1.65		1.85		
DC IN	2.2 TO 3.5	2.72		2.72		
DC IN	1.0 TO 6.7	4.84		5.2		
SBO PWR OUT	0.5 TO 2.5	1.12		1.31		
CLEARANCE POWER SUPPLY 1						
Q5 DC OUT	0.75 TO 3.5A	1.12		1.2		
Q4 DC OUT	0.75 TO 3.5A	1.12		1.2		
DC OUT	26.5 TO 29.5V	28.6		28.2		
PRE REG	30 TO 38	35.8		35.5		
CLEARANCE POWER SUPPLY 2						
Q9 DC OUT	0.75 TO 3.5A	1.4		1.5		
Q10 DC OUT	0.75 TO 3.5A	1.2		1.3		
DC OUT	26.5 TO 29.5V	28.5		28.2		
PRE REG	30 TO 38	36.1		36.0		
CLEARANCE TRANSMITTER						
OSC TUNE	0.5 MIN	1.25		1.58		
REMARKS						

CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	ADJUSTED	INITIAL	ADJUSTED	
EXCTR OUTPUT	0.85 TO 3.0	2.5		2.2		
CSB PA	1.0 TO 3.25	1.28		1.38		
SBO PA	0.50 TO 2.0	1.25		1.18		
CSB PWR OUT	0.20 TO 1.95	0.69		0.58		
DC IN	2.2 TO 3.5	2.8		2.7		
DC IN	1.0 TO 6.7	3.36		3.3		
SBO PWR OUT	0.20 TO 2.5	0.84		1.1		
COURSE MONITOR 1						
TEST DDM	0.500 ± 0.02	.510		.510		
COURSE DDM	0.000 ± 0.011	.004/90	.001/150	.004/90	0	
WIDTH DDM	0.141 TO 0.175	.159	.155	.155	.155	
RF LEVEL	100.0 ± 10.0	100.8	100.0	102.6	101.0	
MOD	LAST FC ± 4.0°	40.4	40.5	38.8	40.4	
ID MOD	005.0 ± 2.0	4.7	4.1	4.6		
COURSE MONITOR 2						
TEST DDM	0.500 ± 0.02	.511		.512		
COURSE DDM	0.000 ± 0.011	.002/90	.001/150	.003/90	.001/90	
WIDTH DDM	0.141 TO 0.175	.158	.156	.154	.155	
RF LEVEL	100.0 ± 10.0	100.3	100.1	102.0	101.0	
MOD	LAST FC ± 4.0°	41.1	41.3	39.9	41.2	
ID MOD	005.0 ± 2.0	4.6	4.5	5.1	5.1	
CLEARANCE MONITOR 1						
TEST DDM	0.500 ± 0.02	.511		.510		
COURSE DDM	0.000 ± 0.026	.005/90	0	.005/90	.001/90	
WIDTH DDM	0.129 TO 0.181	.151	.154	.146	.155	
RF LEVEL	100.0 ± 10.0	101.1	100.4	101.0	101.2	
MOD	LAST FC ± 4.0°	38.3	41.6	38.5	41.5	
ID MOD	005.0 ± 2.0	4.1	4.0	4.0		
FREQ SEP	9.5 ± 1.0	9.3		9.1	9.2	
CLEARANCE MONITOR 2						
TEST DDM	0.500 ± 0.02	.513		.512		
COURSE DDM	0.000 ± 0.026	.006/90		.006/90		
WIDTH DDM	0.129 TO 0.181	.149	.155	.145	.155	
RF LEVEL	100.0 ± 10.0	101.2	100.1	100.9		
MOD	LAST FC ± 4.0°	39.4	42.9	39.6	42.8	
ID MOD	005.0 ± 2.0	4.5		4.4		
FREQ SEP	9.5 ± 1.0	9.3		9.0	9.1	
ALARM LIMITS						
COURSE MONITOR		MONITOR 1		MONITOR 2		
ID MOD LOWER	003.0 ± 0.5	2.9		2.9		
UPPER	18.40 ± 3.0	16.8		16.8		
MOD LOWER	004.0 BELOW NORMAL	35.1	36.5	35.7	37.1	
UPPER	004.0 ABOVE NORMAL	43.0	44.5	43.5	45.2	
RF LEVEL LOWER	90.0 ± 0.5	89.9		90.0		
WIDTH DDM LOWER	0.141 ± 0.002	.141		.141		
UPPER	0.175 ± 0.002	.175		.175		
COURSE DDM						
UPPER	0.011 ± 0.004	.010		.011		
TEST DDM LOWER	0.426 ± 0.03	.416		.412		
UPPER	0.887 ± 0.03	.544		.540		
REMARKS						

MONITOR ALARMS (CONTINUED)

CHECK		SPECIFICATION	MONITOR 1		MONITOR 2		REMARKS
			INITIAL	ADJUSTED	INITIAL	ADJUSTED	
CLEARANCE MONITOR ALARM LIMITS							
FREQ SEP	LOWER	5.000 ± 0.2	4.9		4.9		
	UPPER	14.00 ± 0.2	13.9		14.1		
ID MOD	LOWER	003.0 ± 0.5	2.9		3.0		
	UPPER	018.4 ± 3.0	17.2		18.3		
% MOD	LOWER	4.0 BELOW NORMAL	34.6	37.6	36.1	38.8	
	UPPER	4.0 ABOVE NORMAL	42.6	45.5	44.2	46.8	
RF LEVEL	LOWER	90.0 ± 0.5	90.0		90.2		
WIDTH DDM	LOWER	0.129 ± 0.002	.129		.129		
	UPPER	0.181 ± 0.002	.181		.181		
COURSE DDM							
	UPPER	0.026 ± 0.004	.026		.026		
TEST DDM	LOWER	0.426 ± 0.03	.403		.417		
	UPPER	0.557 ± 0.03	.527		.548		

FAR FIELD MONITOR 1 TESTS	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	ADJUSTED	INITIAL	ADJUSTED	
DDM	0.000 ± 0.005	.002/90	0	.003/90	0	
DDM ALARM	0.011 ± 0.004	.010		.010		
% MOD	40.0 ± 10.0	45		44	45	
% MOD ALARM	20.0 ± 1.0	19		20		
FAR FIELD MONITOR 2 TESTS						
DDM	0.000 ± 0.005	.003/90	0	.004/90	0	
DDM ALARM	0.011 ± 0.004	.011		.010		
% MOD	40.0 ± 10.0	46	47	46	47	
% MOD ALARM	20.0 ± 1.0	19		20		

REMARKS

* - The "ADJUSTED" readings were recorded following the flight evaluation.

SSILS LOCALIZER SUBSYSTEM PERFORMANCE CHECKS

DATE

10 December 1980

LOCATION Tinker AFB, OK				EQUIPMENT AND SERIAL NUMBER AN/GRN-30 SN:77007		TECHNICIAN Mr. Conley MSgt Thibodeau	
CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS	
		INITIAL	ADJUSTED	INITIAL	ADJUSTED		
CARRIER FREQUENCY							
COURSE	0.002% 109+	.504182		.50450		109.5025-109.5069	
CLEARANCE	0.002% 109+	.494729		.49517		109.4930-109.4974	
MODULATION BALANCE							
COURSE	Centerline	.001/90		.001/90			
CLEARANCE	30° Gnd Ck Pt	.010/90	0	.010/90	0		
PHASING							
COURSE 150Hz	Far Field 30°	.027/90	010/150	009/150	008/150		
COURSE 90Hz	Far Field 30°	.050/150	010/150	005/150	002/150		
CLEARANCE 150Hz	30° Gnd Ck Pt	.185/90	001/90	155/90	001/150		
CLEARANCE 90Hz	30° Gnd Ck Pt	.155/150	002/90	145/150	013/90		
ANTENNA VSWR							
CHECK	SPECIFICATION	dB	VSWR	CHECK	SPECIFICATION	dB	VSWR
1L		-34.9	1.037:1	1R		-38.6	1.024:1
2L		-34.5	1.038:1	2R		-37.3	1.028:1
3L		-37	1.029:1	3R		-34.8	1.037:1
4L		-28.4	1.079:1	4R		-31.9	1.052:1
5L		-27.2	1.091:1	5R		-32.5	1.049:1
6L		-32.3	1.050:1	6R		-36.1	1.032:1
7L		-31.1	1.057:1	7R		-31.8	1.053:1
CABLING PHASE SHIFTS							
ANTENNA FEEDLINES				MONITOR RETURN			
CHECK		INITIAL	ADJUSTED	CHECK		INITIAL	ADJUSTED
1L		-115		1L		-13.5	
2L		-117		2L		-11	
3L		-110		3L		-12	
4L		-109.5		4L		-14	
5L		-110		5L		-13	
6L		-110.5		6L		-14	
7L		-112		7L		-18	
1R		-41		1R		-14	
2R		-36		2R		-14	
3R		-33		3R		-14	
4R		-28		4R		-22	
5R		-22		5R		-19	
6R		-26		6R		-22.5	
7R		-19		7R		-27	
ANTENNA RF NULLS							
PAIR	SPECIFICATION	INITIAL	ADJUSTED	PAIR	SPECIFICATION	INITIAL	ADJUSTED
1		3' 150		5		6" 90	
2		2' 90		6		0	
3		2' 90		7		8" 150	
4		1' 6" 90		COMP		5" 90	
REMARKS							

SSILS LOCALIZER SUBSYSTEM PERFORMANCE CHECKS							DATE 10 December 1980	
LOCATION Tinker AFB, OK			EQUIPMENT AND SERIAL NUMBER AN/GRN-30 SN: 77007				TECHNICIAN Mr. Conley MSgt Thibodeau	
COURSE DU C+SB AMPLITUDES								
CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS	
7L(J9)	0.147 - 0.173	0.167	7R(J16)	0.162	7L-7R	±0.010	0.005	
6L(J8)	0.147 - 0.173	0.165	6R(J15)	0.163	6L-6R	±0.010	0.002	
5L(J7)	0.452 - 0.530	0.518	5R(J14)	0.514	5L-5R	±0.030	0.004	
4L(J6)	REF ± 0.030	0.489	4R(J13)	0.491	4L-4R	±0.030	0.002	
3L(J5)	0.657 - 0.771	0.718	3R(J9)	0.700	3L-3R	±0.043	0.018	
2L(J4)	0.920 - 1.080	1.008	2R(J8)	0.980	2L-2R	±0.060	0.028	
1L(J3)	0.821 - 0.964	0.887	1R(J7)	0.872	1L-1R	±0.054	0.015	
COURSE DU C+SB SIGNAL PHASE								
CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	III ERROR	REMARKS
7L(J9)	+82	80.6	-1.4	7R(J16)	0	0	0	
6L(J8)	+82	81.2	-0.8	6R(J15)	0	0.2	+0.2	
5L(J7)	+82	81.0	-1.0	5R(J14)	0	-0.8	-0.8	
4L(J6)	+82	81.1	-1.1	4R(J13)	0	0	0	
3L(J5)	+82	84.1	+2.1	3R(J9)	0	+1.9	+1.9	
2L(J4)	+82	84.0	+2.0	2R(J8)	0	+0.7	+0.7	
1L(J3)	+82	80.1	-1.9	1R(J7)	0	-0.8	-0.8	
COURSE DU SBO AMPLITUDES								
CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS	
7L(J9)	0.330 - 0.404	0.362	7R(J16)	0.371	7L-7R	±0.012	0.009	
6L(J8)	0.443 - 0.599	0.560	6R(J15)	0.562	6L-6R	±0.018	0.002	
5L(J7)	0.818 - 0.960	0.923	5R(J14)	0.932	5L-5R	±0.029	0.009	
4L(J6)	REF + 0.033	0.998	4R(J13)	1.000	4L-4R	±0.033	0.002	
3L(J5)	0.921 - 1.060	0.980	3R(J9)	1.011	3L-3R	±0.033	0.031	
2L(J4)	0.614 - 0.720	0.667	2R(J8)	0.683	2L-2R	±0.022	0.016	
1L(J3)	0.204 - 0.240	0.205	1R(J7)	0.220	1L-1R	±0.014	0.015**	
COURSE DU SBO SIGNAL PHASE								
CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	ERROR	REMARKS
7L(J9)	-98	-100.0	-2.0	7R(J16)	0	-1.2	-1.2	
6L(J8)	-98	-97.0	+1.0	6R(J15)	0	+0.5	+0.5	
5L(J7)	-98	-97.3	+0.7	5R(J14)	0	+0.5	+0.5	
4L(J6)	-98	-99.0	-1.0	4R(J13)	0	0	0	
3L(J5)	-98	-97.6	+0.4	3R(J9)	0	+2.5	+2.5	
2L(J4)	-98	-99.2	-1.2	2R(J8)	0	+0.6	+0.6	
1L(J3)	-98	-102.3	-4.3	1R(J7)	0	+0.3	+0.3	
COURSE PHASE ERROR								
CHECK	CSB ERR	SBO ER	DIFF	CHECK	CSB ERR	SBO ER	DIFF	REMARKS
7L(J9)	-1.4	-2.0	+0.6	7R(J16)	0	-1.2	+1.2	
6L(J8)	-0.8	+1.0	-1.8	6R(J15)	+0.2	+0.5	-0.3	
5L(J7)	-1.0	+0.7	-1.7	5R(J14)	-0.8	+0.5	-1.3	
4L(J6)	-1.1	-1.0	-0.1	4R(J13)	0	0	0	
3L(J5)	+2.1	+0.4	+1.7	3R(J9)	+1.9	+2.5	-0.6	
2L(J4)	+2.0	-1.2	+3.2	2R(J8)	+0.7	+0.6	+0.1	
1L(J3)	-1.9	-4.3	+2.4	1R(J7)	-0.8	+0.3	-1.1	
SPREAD	5.00							
REMARKS								

DISTRIBUTION UNIT CHECKS (Continued)

CLEARANCE DU C+SB AMPLITUDES								
CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS	
3L(J3)	0.134 - 0.216	0.197	3R(J9)	0.199	3L-3R	±0.012	0.002	
1L(J3)	REF ±0.060	0.998	1R(J7)	1.000	1L-1R	±0.060	0.002	
CLEARANCE C+SB SIGNAL PHASE								
CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	ERROR	REMARKS
3L(J3)	+82	80.9	-1.1	3R(J9)	0	-6.7	-6.7	
1L(J3)	+82	78.8	-3.2	1R(J7)	0	0	0	
CLEARANCE DU SBO AMPLITUDES								
CHECK	SPECIFICATION	MEAS	CHECK	MEAS	CHECK	BAL	MEAS	
3L(J3)	0.121 - 0.157	0.138	1R(J9)	0.135	3L-3R	±0.008	0.003	
2L(J4)	0.306 - 0.360	0.337	2R(J8)	0.337	2L-2R	±0.010	0	
1L(J3)	REF ±0.033	0.998	1R(J7)	1.000	1L-1R	±0.033	0.002	
CLEARANCE SBO SIGNAL PHASE								
CHECK	NOMINAL	MEAS	ERROR	CHECK	NOMINAL	MEAS	ERROR	REMARKS
3L(J3)	-98	-101.7	-3.7	3R(J9)	0	-1.0	-1.0	
2L(J4)	-98	-99.0	-1.0	2R(J8)	0	-0.1	-0.1	
1L(J3)	-98	-99.1	-1.1	1R(J7)	0	0	0	
CLEARANCE PHASE ERROR								
CHECK	CSB ERR	SBO ERR	DIFF	CHECK	CSB ERR	SBO ERR	DIFF	REMARKS
3L(J3)	-1.1	-3.7	+2.6	3R(J9)	-6.7	-1.0	-5.7	
2L(J4)	----	-1.0	+1.0	2R(J8)	----	-0.1	+0.1	
1L(J3)	-3.2	-1.1	-2.1	1R(J7)	0	0	0	

REMARKS

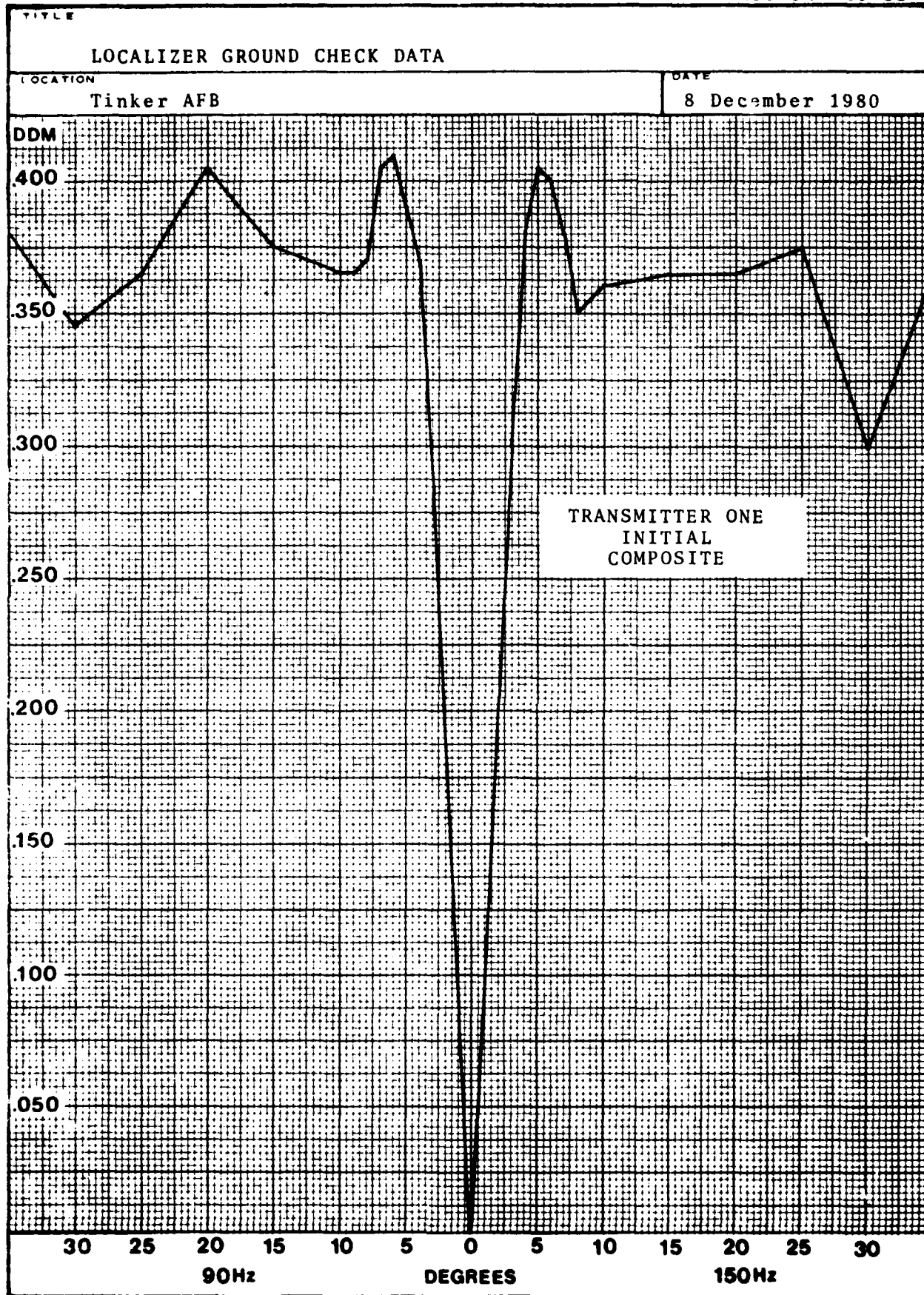
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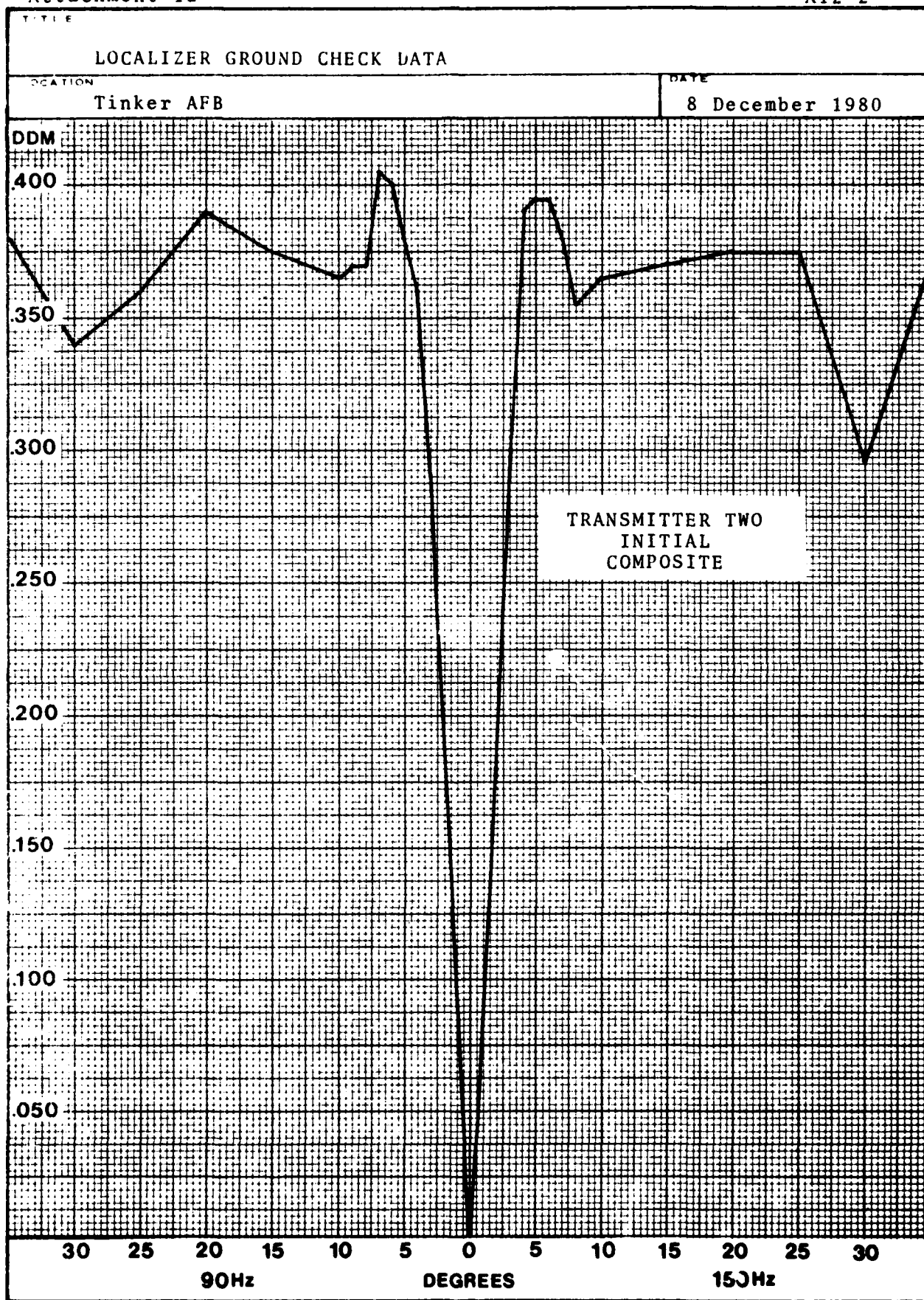
TITLE: SSILS SUBSYSTEM PERFORMANCE CHECKS																																																						
LOCATION Tinker AFB		DATE 10 December 1980																																																				
<p style="text-align: center;">ADDITIONAL CHECKS</p> <p style="text-align: center;">RESULTS OF ANTENNA PAIR STACKING</p> <table> <thead> <tr> <th>PAIR #</th> <th>DDM ON C/L</th> <th>DISTANCE TO DDM NULL</th> <th>FFM INDICATIONS</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>.018/90</td> <td>10" /150</td> <td>.002 / 90</td> </tr> <tr> <td>6 & 7</td> <td>.003/90</td> <td>2" /150</td> <td>.005 / 90</td> </tr> <tr> <td>5 - 7</td> <td>.003/150</td> <td>1" /90</td> <td>.005 / 90</td> </tr> <tr> <td>4 - 7</td> <td>.008/150</td> <td>5" /90</td> <td>.005 / 90</td> </tr> <tr> <td>3 - 7</td> <td>.009/150</td> <td>7" /90</td> <td>.003 / 90</td> </tr> <tr> <td>2 - 7</td> <td>.004/150</td> <td>5" /90</td> <td>.003 / 90</td> </tr> <tr> <td>1 - 7</td> <td>.003/150</td> <td>5" /90</td> <td>.004 / 90</td> </tr> </tbody> </table> <p>MEASUREMENTS MADE AT THE CENTERLINE 1000' GROUND CHECKPOINT</p>				PAIR #	DDM ON C/L	DISTANCE TO DDM NULL	FFM INDICATIONS	7	.018/90	10" /150	.002 / 90	6 & 7	.003/90	2" /150	.005 / 90	5 - 7	.003/150	1" /90	.005 / 90	4 - 7	.008/150	5" /90	.005 / 90	3 - 7	.009/150	7" /90	.003 / 90	2 - 7	.004/150	5" /90	.003 / 90	1 - 7	.003/150	5" /90	.004 / 90																			
PAIR #	DDM ON C/L	DISTANCE TO DDM NULL	FFM INDICATIONS																																																			
7	.018/90	10" /150	.002 / 90																																																			
6 & 7	.003/90	2" /150	.005 / 90																																																			
5 - 7	.003/150	1" /90	.005 / 90																																																			
4 - 7	.008/150	5" /90	.005 / 90																																																			
3 - 7	.009/150	7" /90	.003 / 90																																																			
2 - 7	.004/150	5" /90	.003 / 90																																																			
1 - 7	.003/150	5" /90	.004 / 90																																																			
<p style="text-align: center;">FINAL CHECKS MONITOR READINGS</p> <p style="text-align: right;">19 December 1980</p> <table> <thead> <tr> <th>FUNCTION</th> <th>TRANSMITTER ONE</th> <th>TRANSMITTER TWO</th> </tr> </thead> <tbody> <tr> <td>COURSE MOD BALANCE</td> <td></td> <td></td> </tr> <tr> <td>COURSE ONE</td> <td>0</td> <td>.001 / 90</td> </tr> <tr> <td>WIDTH ONE</td> <td>.002 / 150</td> <td>.001 / 150</td> </tr> <tr> <td>COURSE TWO</td> <td>0</td> <td>.001 / 90</td> </tr> <tr> <td>WIDTH TWO</td> <td>.004 / 150</td> <td>.003 / 150</td> </tr> <tr> <td>CLEARANCE MOD BALANCE</td> <td></td> <td></td> </tr> <tr> <td>CLEAR COURSE ONE</td> <td>.005 / 90</td> <td>.007 / 90</td> </tr> <tr> <td>CLEAR WIDTH ONE</td> <td>.007 / 90</td> <td>.008 / 90</td> </tr> <tr> <td>CLEAR COURSE TWO</td> <td>.005 / 90</td> <td>.007 / 90</td> </tr> <tr> <td>CLEAR WIDTH TWO</td> <td>.009 / 90</td> <td>.011 / 90</td> </tr> <tr> <td>COURSE QUARATURE</td> <td></td> <td></td> </tr> <tr> <td>WIDTH ONE</td> <td>.003 / 150</td> <td>.007 / 90</td> </tr> <tr> <td>WIDTH TWO</td> <td>.004 / 150</td> <td>.005 / 90</td> </tr> <tr> <td>CLEARANCE QUADRATURE</td> <td></td> <td></td> </tr> <tr> <td>CLEAR WIDTH ONE</td> <td>.007 / 90</td> <td>.008 / 90</td> </tr> <tr> <td>CLEAR WIDTH TWO</td> <td>.009 / 90</td> <td>.010 / 90</td> </tr> </tbody> </table>				FUNCTION	TRANSMITTER ONE	TRANSMITTER TWO	COURSE MOD BALANCE			COURSE ONE	0	.001 / 90	WIDTH ONE	.002 / 150	.001 / 150	COURSE TWO	0	.001 / 90	WIDTH TWO	.004 / 150	.003 / 150	CLEARANCE MOD BALANCE			CLEAR COURSE ONE	.005 / 90	.007 / 90	CLEAR WIDTH ONE	.007 / 90	.008 / 90	CLEAR COURSE TWO	.005 / 90	.007 / 90	CLEAR WIDTH TWO	.009 / 90	.011 / 90	COURSE QUARATURE			WIDTH ONE	.003 / 150	.007 / 90	WIDTH TWO	.004 / 150	.005 / 90	CLEARANCE QUADRATURE			CLEAR WIDTH ONE	.007 / 90	.008 / 90	CLEAR WIDTH TWO	.009 / 90	.010 / 90
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REMARKS																																																						

LOCALIZER GROUND CHECK RECORD

FACILITY LOCATION Tinker AFB, OK						EQUIPMENT SERIAL NO. AN/GRN-30 SN77007				MONTH AND YEAR December 1980			
DATE	8 Dec		8 Dec		9 Dec		9 Dec		9 Dec		9 Dec		
FUNCTION	COMPOSITE		COURSE ONLY		CLEAR ONLY		COURSE QUAD		CLEAR QUAD		CRS NAR CLR WIDE		
XMTR NO.	1	2	1	2	1	2	1	2	1	2	1	2	
90HZ	35	.380 .380			.420 .420		.190* .210*	200*	.365 .380				
	30	.345 .340			.420 .400		.030 .155*	145*	.305 .310				
	25	.365 .360			.420 .420		.065* .170*	155*	.355 .360				
	20	.405 .390			.420 .420	.060 .038	.240* .225*	.380 .390					
	15	.375 .375			.415 .420	.120* .220*	.295* .270*	.365 .370					
	10	.365 .365		.110*	.380 .390	.080 .150	.240* .330*	.345 .360					
	9	.365 .370	.240 .195	.365 .370	.185* .090*	.225* .215*	.350 .360						
	8	.370 .370	.350 .355	.350 .360	.300* .140*	.210* .195*	.360 .360						
	7	.405 .405	.410 .405	.300 .300	.295* .175*	.190* .180*	.410 .400						
	6	.410 .400	.420 .395	.255 .260	.235* .145*	.170* .160*	.415 .410						
	5	.390 .380	.395 .390	.210 .210	.180* .110*	.145* .140*	.390 .410						
	4	.370 .360	.380 .370	.165 .165	.135* .085*	.120* .115*	.380 .370						
	3	.285 .290	.300 .305	.125 .120	.095* .060*	.090* .085*	.320 .340						
	2	.180 .190	.195 .195	.080 .080	.060* .035*	.055* .055*	.205 .215						
	W/P	.155 .155	.160 .160	.065 .065	.050* .030*	.048* .046*	.170 .175						
	1	.095 .090	.095 .095	.039 .040	.032* .020*	.026* .025*	.105 .105						
	0	.003/150 .001/150	.002/150 0	.002/150 .001/150	.005/150 .002/150	.009/90 .008/90	.002/150 .002/150						
	1	.095 .090	.105 .095	.044 .045	.024* .012*	.044* .041*	.105 .110						
	W/P	.155 .160	.165 .160	.070 .075	.042* .027*	.065* .060*	.175 .180						
	2	.190 .190	.205 .195	.085 .090	.055* .033*	.075* .070*	.210 .220						
190Z	3	.300 .300	.320 .310	.125 .130	.085* .055*	.110* .100*	.325 .330						
	4	.380 .390	.395 .395	.170 .175	.125* .080*	.135* .125*	.410 .380						
	5	.405 .395	.420 .390	.215 .215	.215* .115*	.160* .145*	.410 .400						
	6	.400 .395	.410 .400	.260 .265	.285* .220*	.180* .165*	.400 .400						
	7	.380 .380	.400 .385	.305 .310	.275* .210*	.200* .180*	.375 .370						
	8	.350 .355	.295 .270	.340 .360	.250* .185*	.215* .195*	.345 .350						
	9	.355 .360		.065* .375	.360 .075*	.002 .235*	.220* .310 .360						
	10	.360 .365		.320* .375	.390 .145*	.155* .310*	.225* .310 .320						
	15	.365 .370			.365 .390	.225* .200*	.315* .300*	.350 .360					
	20	.365 .375			.365 .380	.085 .095	.305* .280*	.370 .380					
	25	.375 .375			.370 .390	.008 .017	.260* .165*	.350 .350					
	30	.300 .295			.380 .390	.022 .022	.185* .155*	.280 .280					
	35	.360 .365			.365 .380	.215* .210*	.295* .260*	.360 .370					
* - INDICATES REVERSE SENSING													

* - INDICATES REVERSE SENSING





TITLE:

LOCALIZER GROUND CHECK DATA

LOCATION

Tinker AFB

DATE

9 December 1980

DDM

150 Hz

90 Hz

TRANSMITTER ONE
INITIAL
CLEARANCE QUADRATURE

30

25

20

15

10

5

0

5

10

15

20

25

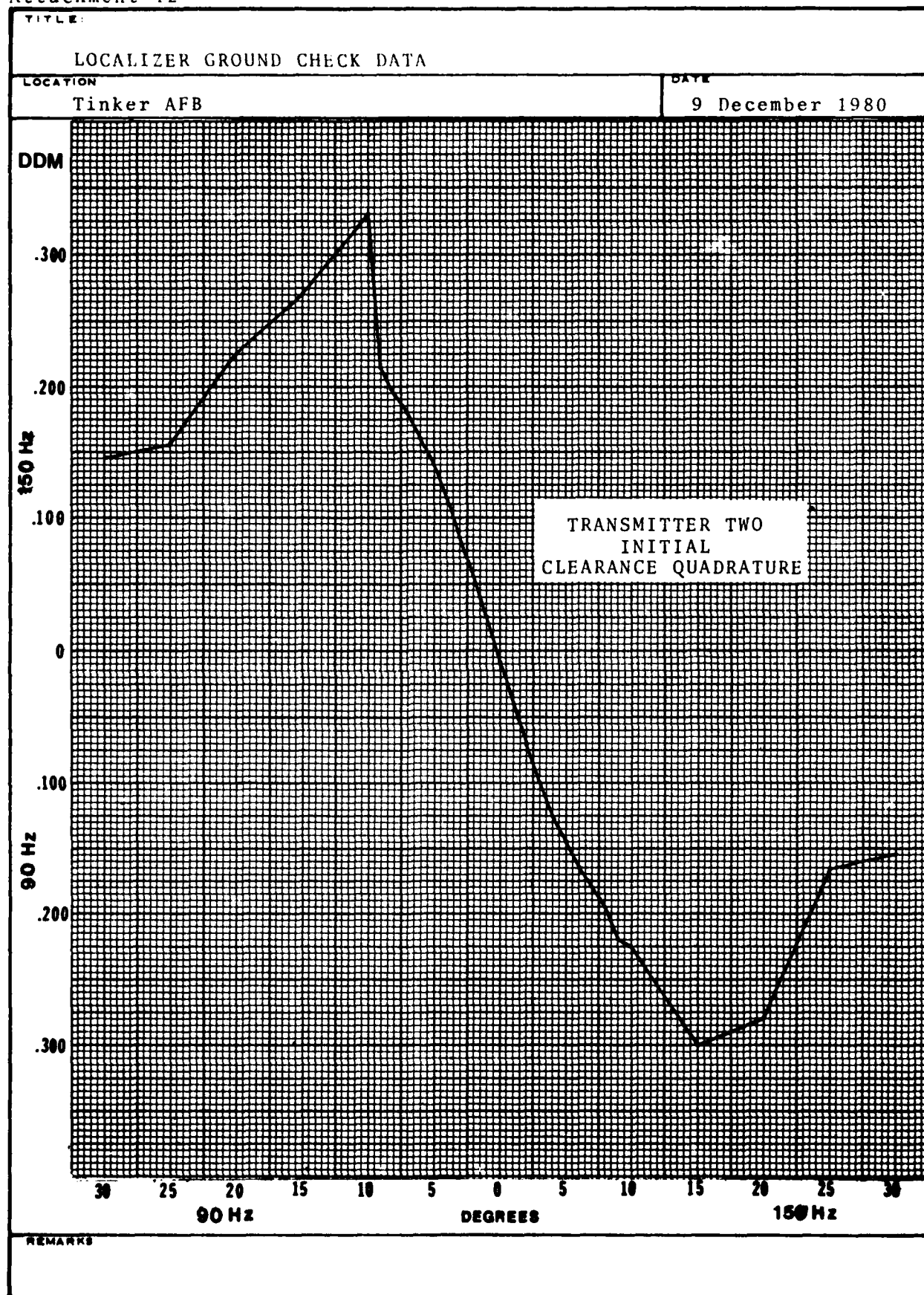
30

90 Hz

DEGREES

150 Hz

REMARKS



TITLE:

LOCALIZER GROUND CHECK DATA

LOCATION

Tinker AFB

DATE

15 December 1980

DDM

.300

.200

.100

0

.100

90 Hz

.200

.300

TRANSMITTER ONE
FINAL
CLEARANCE QUADRATURE

30

25

20

15

10

5

0

5

10

15

20

25

30

90 Hz

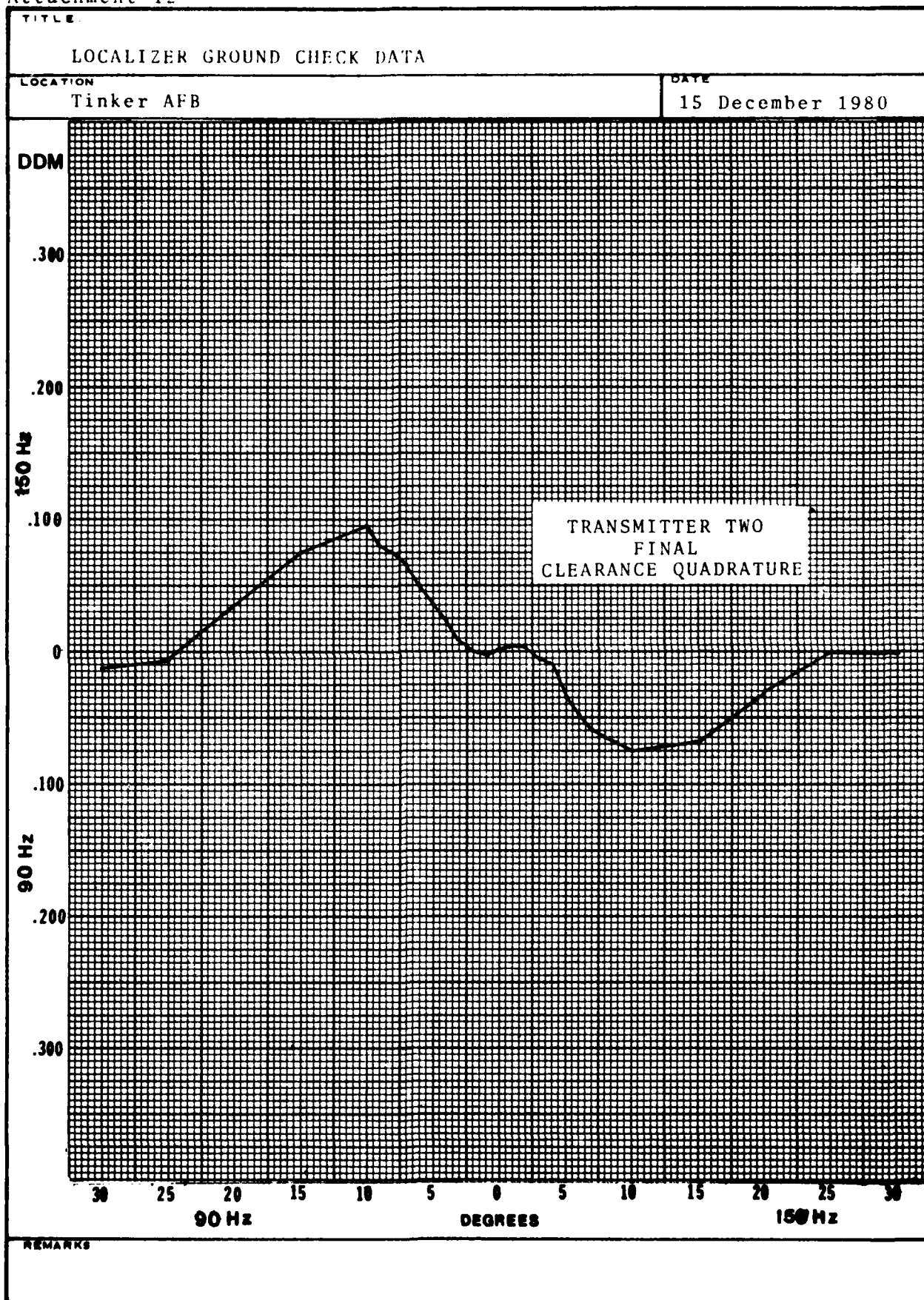
DEGREES

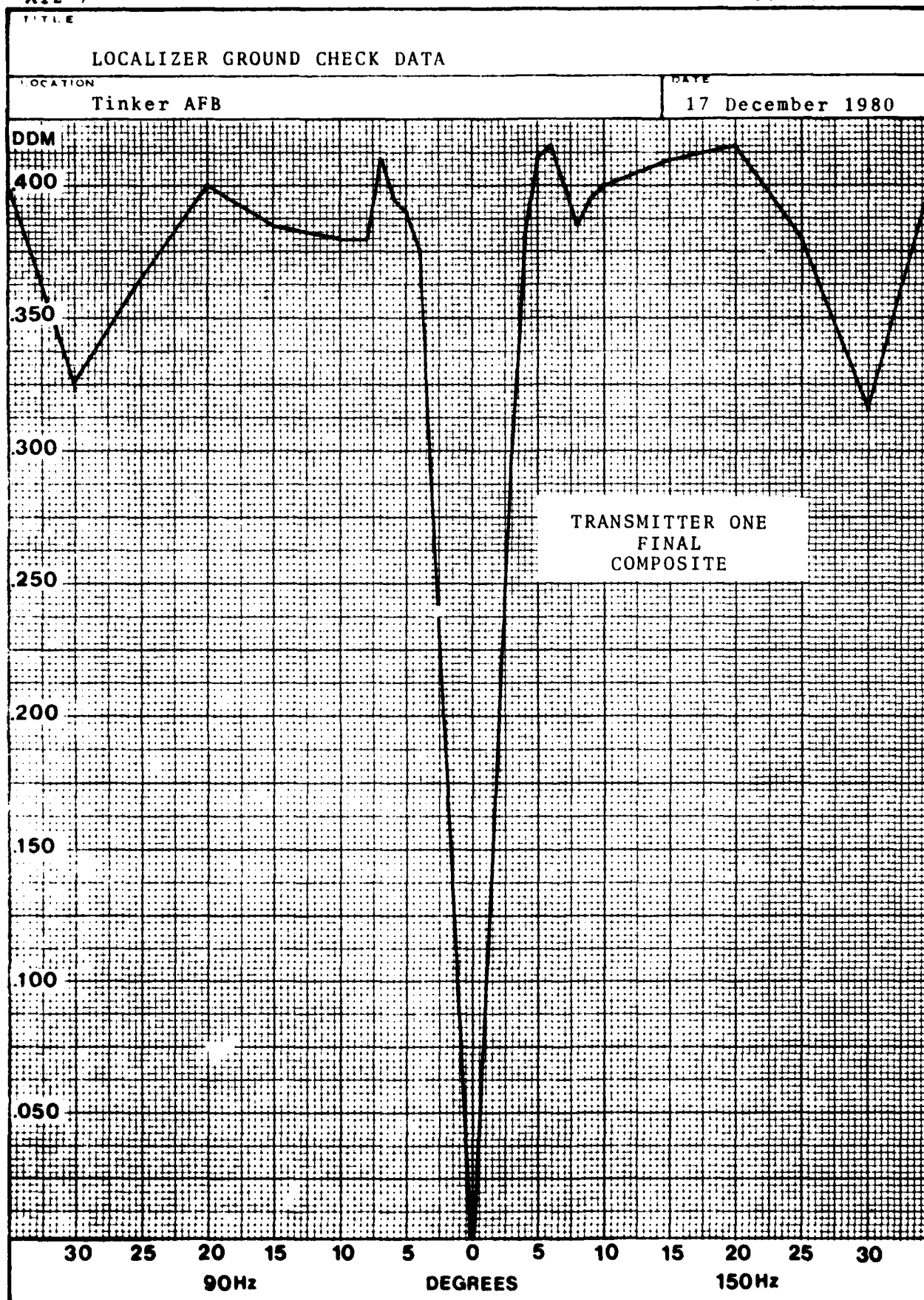
150 Hz

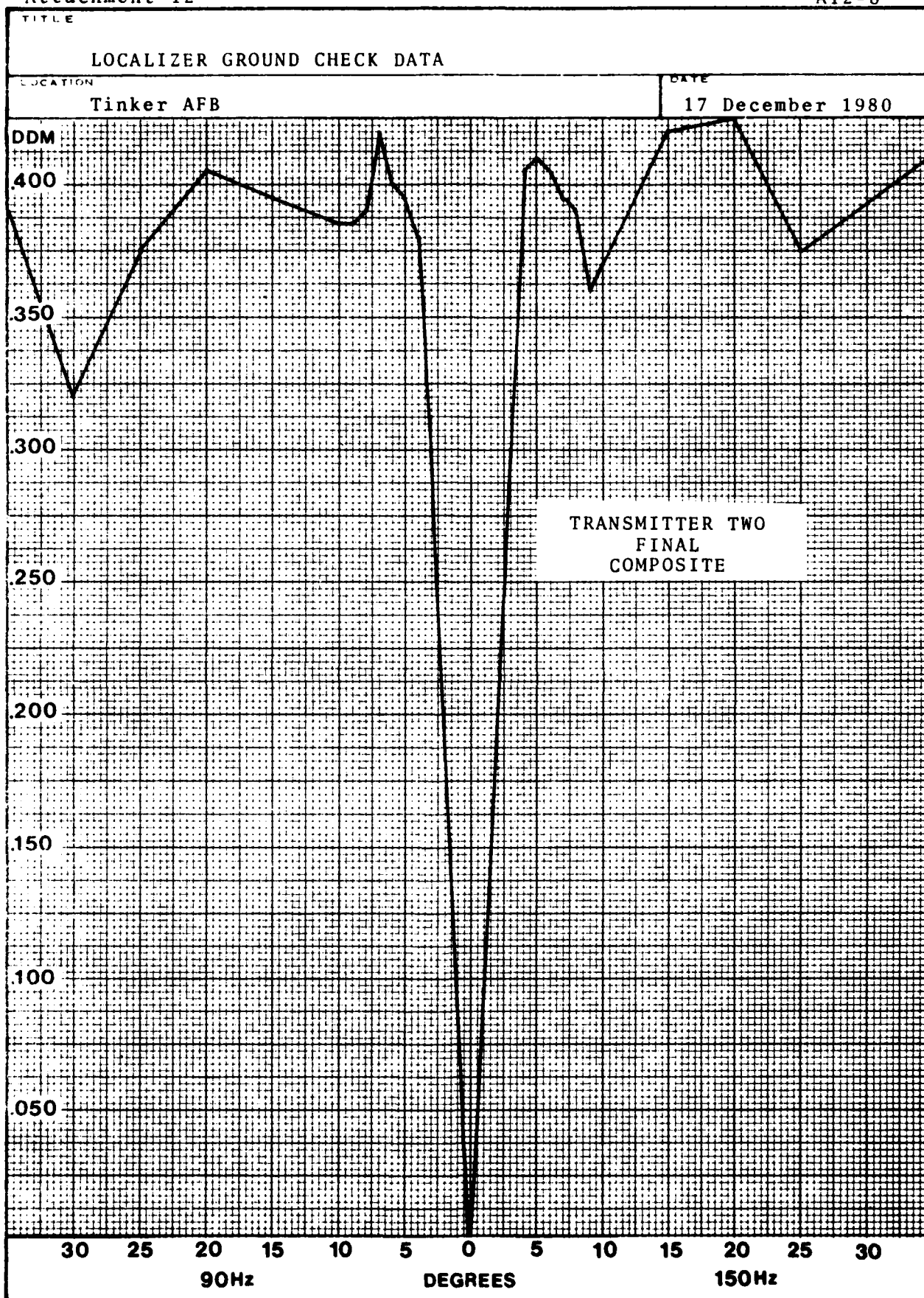
REMARKS

AFCS FORM MAY 73 906

GENERAL INFORMATION







SSILS GLIDE SLOPE INITIAL PERFORMANCE CHECKLIST						DATE 8 December 1980
LOCATION Tinker AFB, OK		EQUIPMENT AND SERIAL NO. AN/GRN-31 SN: 77007				TECHNICIAN Mr. Conley MSgt Thibodeau
CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	ADJUSTED	INITIAL	ADJUSTED	
POWER						
COURSE CARRIER IN						
LOWER ANTENNA		3.3W	3.0W	3.2W	3.0W	
COURSE SBO IN						
MIDDLE ANTENNA		29mW	26mW	30mW	26mW	
CLEARANCE IN						
UPPER ANTENNA						
COURSE 1 MODULATION		77.5%	78.8%	78.8%	78%	
90Hz 2 MODULATION		42.5%		42.5%		
150Hz 2 MODULATION		42.5%		42.5%		
CLEARANCE 2 MOD						
COURSE POWER SUPPLY 1						
Q5 DC OUT	0.75 TO 3.5 A	1.0		1.1		
Q4 DC OUT	0.75 TO 3.5 A	1.1		1.2		
DC OUT	26.5 TO 29.5 V	28		28		
PRE REG	30 TO 38 V	35		35		
COURSE POWER SUPPLY 2						
Q9 DC OUT	0.75 TO 3.5 A	1.0		1.1		
Q10 DC OUT	0.75 TO 3.5 A	1.0		1.1		
DC OUT	26.5 TO 29.5	28		28		
PRE REG	30 TO 38 V	35		35		
COURSE TRANSMITTER						
XTAL DRIVE	0.5 MIN	2.5		3.7		
TRIPLER INPUT	0.2 TO 3.8	2.65		2.6		
EXCTR OUTPUT	0.5 TO 3.0	2.0		1.9		
EXCTR ALC	0.7 TO 3.0	2.05		2.25		
SBO DRIVER	0.2 TO 0.59	0.37		0.33		
CSB DRIVER	0.49 TO 1.50	0.8		0.8		
CSB PWR OUT	0.50 TO 3.90	2.4		2.6		
DC IN	22 TO 35	26.5		27		
DC IN	1.0 TO 3.0	1.92		2.0		
SBO PWR OUT	0.50 TO 4.0	1.65		1.9		
CLEARANCE TRANSMITTER						
TRIPLER INPUT	0.2 TO 3.8					
EXCTR OUTPUT	0.5 TO 3.0					
EXCTR ALC	0.7 TO 3.0					
RF AMP	LESS THAN 0.5					
POWER OUT	0.5 TO 3.0					
REMARKS						

CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	ADJUSTED	INITIAL	ADJUSTED	
COURSE MONITOR 1						
TEST DDM	0.500 ± 0.020	.508		.509		
PATH (Int mon)	0.000 ± 0.050	.001/150	0	.001/150	0	
PATH (Near field)	0.000 ± 0.050	.003/90	0	.008/90	0	
WIDTH DDM	0.155-0.195	.166	.174	.172	.176	
RF LEVEL	100.0 ± 5.0	103.9	100.2	102.7	100.1	
MOD	LAST FC ± 4.0	78.4	78.5	80.5	79.4	
COURSE MONITOR 2						
TEST DDM	0.500 ± 0.020	.509		.509		
PATH (Int mon)	0.000 ± 0.050	.003/150	0	.001/150		
PATH (Near field)	0.000 ± 0.050	.002/90	.001/150	.006/90	.001/150	
WIDTH DDM	0.155-0.195	.163	.175	.170	.176	
RF LEVEL	100.0 ± 5.0	103.9	100.2	102.7	100.1	
MOD	LAST FC ± 4.0	77.6	77.8	79.7	78.8	
CLEARANCE MONITOR 1						
RF LEVEL	100.0 ± 5.0					
MOD	90.0 ± 5.0					
FREQ SEP	8.00 ± 5.0					
CLEARANCE MONITOR 2						
RF LEVEL	100.0 ± 5.0					
MOD	90.0 ± 5.0					
FREQ SEP	8.00 ± 5.0					
ALARM LIMITS						
COURSE MONITOR		MONITOR 1		MONITOR 2		
MOD LOWER	NORMAL -004.0	76.9	74.5	75.8	73.5	
UPPER	NORMAL + 004.0	84.8	82.6	83.9	81.5	
RF LEVEL LOWER		66.2		65.9		
PATH (Near) UPPER	050.0 ± 0.002	.050		.050		
PATH (Int) UPPER	050.0 ± 0.002	.050		.050		
WIDTH DDM LOWER	0.155 ± 0.002	.145*	.155	.144*	.155	
UPPER	0.195 ± 0.002	.204*	.195	.205*	.195	
TEST DDM LOWER	0.426 ± 0.040	.412		.427		
UPPER	0.557 ± 0.040	.542		.558		
CLEARANCE MONITOR ALARM LIMITS						
MOD LOWER	07.50 ± 5.0					
RF LEVEL LOWER	090.0 ± 5.0					
REMARKS						

CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		INITIAL	ADJUSTED	INITIAL	ADJUSTED	
RADIO FREQUENCY						
COURSE	± .002"	332.5984		332.6032		LO=332.59335
CLEARANCE	± .002"					HI=332.60665
ANTENNA VSWR						
UPPER ANTENNA	< 1.2:1	1.12:1				
CENTER ANTENNA	< 1.2:1	1.12:1				
LOWER ANTENNA	< 1.2:1	1.08:1				
GROUND CHECK						
O DDM	LAST FC ± 0.010	11' 8"	11' 8"	11' 8"	11' 8"	
ABOVE PATH	LAST FC ± 0.010	15' 1"	14' 11"	14' 9"	14' 11"	
BELOW PATH	LAST FC ± 0.010	8' 5"	8' 7"	8' 8"	8' 6"	
PHASING						
GROUND CHECKPOINT	LAST FC ± 0.010		.010/90		.009/90	
FAR FIELD	NO SPEC ***	.028/90	.052/90	.110/90	.052/90	
APCU AMP AND PHASE						
		AMPLITUDE		PHASE		
C + SB DISTRIBUTION BALANCE						
SBO DISTRIBUTION BALANCE MID TO LOWER						
SBO DISTRIBUTION BALANCE MID TO UPPER						
CLEARANCE DISTRIBUTION BALANCE		INITIAL	ADJUST	INITIAL	ADJUST	
MOD Balance Far Field ***		.004/150	.002/90	.002/150	.003/90	
MONITOR OFFSETS						
PATH(INT) #1			.005/90		.004/90	
PATH(NF) #1			.010/150		.010/150	
WIDTH #1			.013/90		.013/90	
PATH(INT) #2			.004/90		.003/90	
PATH(NF) #2			.010/150		.013/150	
WIDTH #2			.011/90		.011/90	
IN QUADRATURE READINGS						
WIDTH #1			.017/90		.020/90	
WIDTH #2			.015/90		.018/90	

* - Change 3 to TO 31R4-2GRN31-2 changed the width monitor alarm points from 0.145 to 0.155 and from 0.205 to 0.195. The workcards, 31R4-2GRN31-6WC-1, have not been changed. TO tolerances were applied during the TRACALS Evaluation and the monitors tightened up to the TO specification. Local maintenance will submit an AFTO Form 22.

** - The "ADJUSTED" readings were recorded following the flight evaluation.

*** - Far field modulation balance and phasing were accomplished at the Localizer far field monitor.

A. C. POWER						DATE 11 December 1980	
LOCATION Tinker AFB				EQUIPMENT & SERIAL NUMBER AN/GRN-30 SN: 77007			
CHECK	SPECIFICATIONS	PRIME POWER			STANDBY POWER		
1. VISUAL INSPECTION		SAT			SAT		
2. REGULATOR INPUT		VOLTAGE		CURRENT	VOLTAGE		CURRENT
		INITIAL	ADJUSTED		INITIAL	ADJUSTED	
PHASE A		124		4.5	122		5
PHASE B		124		6	122		7
PHASE C							
A + B		244			240		
NEUTRAL							
3. POWER FACTOR							
GENERATOR	MANUFACTURER Katolight	TYPE D20FGH4			SERIAL NUMBER 76671-2S-27862		
	CAPACITY 20 kW	FREQUENCY 60 Hz			LOAD		
AUTOMATIC CHANGEOVER	MANUFACTURER Zenith	TYPE ZTS10B-2EHTU			CHANGEOVER INTERVAL 5 seconds		
VOLTAGE REGULATOR RESPONSE							
VOLTAGE REGULATOR	SPECIFICATION	AS FOUND	ADJUSTED TO:		TIME TO ADJUST		
			MANUALLY	AUTOMATIC			
PHASE A							
PHASE B							
PHASE C							
EQUIPMENT GROUNDING							
REMARKS The primary and backup power sources for the Localizer are adequate and reliable.							

A. C. POWER					DATE 11 December 1980		
LOCATION Tinker AFB			EQUIPMENT & SERIAL NUMBER AN/GRN-31 SN: 77007				
CHECK	SPECIFICATIONS	PRIME POWER			STANDBY POWER		
1. VISUAL INSPECTION		SAT			SAT		
2. REGULATOR INPUT		VOLTAGE		CURRENT	VOLTAGE		CURRENT
		INITIAL	ADJUSTED		INITIAL	ADJUSTED	
PHASE A		131		6.8	124		6.8
PHASE B		131		4.2	124		4.2
PHASE C							
A + B		260			245		
NEUTRAL							
3. POWER FACTOR							
GENERATOR	MANUFACTURER Katolight	TYPE D20FGH4			SERIAL NUMBER 76671-1S-27862		
	CAPACITY 20 kW	FREQUENCY 60 Hz			LOAD		
AUTOMATIC CHANGEOVER	MANUFACTURER Zenith	TYPE ZTS10B-2EHTU			CHANGEOVER INTERVAL 6 seconds		
VOLTAGE REGULATOR RESPONSE							
VOLTAGE REGULATOR	SPECIFICATION	AS FOUND	ADJUSTED TO:		TIME TO ADJUST		
			MANUALLY	AUTOMATIC			
PHASE A							
PHASE B							
PHASE C							
EQUIPMENT GROUNDING							
REMARKS The primary power appeared to be slightly high. Local maintenance was advised to notify BCE. The backup power was adequate and reliable.							

SSILS LOC. PRE-POST AIRBORNE EVALUATION CHECKLIST						DATE 16 December 1980
CHECK	SPECIFICATION	TRANSMITTER NO. 1		TRANSMITTER NO. 2		REMARKS
		PRE	POST	PRE	POST	
COURSE CARRIER POWER		15W	15W	15W	15.2W	
COURSE SB POWER		300mW	300mW	300mW	300mW	
CLEARANCE CARRIER POWER		4W	4W	4W	4W	
CLEARANCE SB POWER		130mW	130mW	140mW	140mW	
COURSE % MODULATION		40%	41.3%	40%	38.8%	
CLEARANCE % MODULATION		41.3%	48.8%*	42.5%	42.5%	
MONITORS COURSE I						
COURSE DDM	0.000 ± 0.011	.002/90	.001/90	.004/90	.004/90	**
WIDTH DDM	0.141 TO 0.175	.152	.156	.151	.153	
RF LEVEL	100.0 ± 10.0	99.5	99.8	99.6	101.2	
% MOD	LAST FC ± 0.004	40.5	40.6	39.6	39.6	
ID % MOD	005.0 ± 2.0	4.0	5.2	4.6	4.6	
COURSE II						
COURSE DDM	0.000 ± 0.011	.001/90	.001/90	.003/90	.003/90	**
WIDTH DDM	0.141 TO 0.175	.151	.156	.150	.153	
RF LEVEL	100.0 ± 10.0	99.5	99.7	99.6	101.2	
% MOD	LAST FC ± 0.004	41.2	41.4	40.3	40.3	
ID % MOD	005.0 ± 2.0	4.5	4.4	5.1	4.9	
CLEARANCE I						
COURSE DDM	0.000 ± 0.026	.004/150	.005/150	.002/150	.003/150	
WIDTH DDM	0.129 TO 0.181	.173	.174	.178	.179	**
RF LEVEL	100.0 ± 10.0	94.3	99.9	94.0	99.8	
% MOD	LAST FC ± 0.004	39.9	46.1	40.0	40.0	
ID % MOD	005.0 ± 2.0	3.9	3.9	4.0	4.2	
FREQ SEP	9.5 ± 1.0	9.5	9.4	9.2	9.1	
CLEARANCE II						
COURSE DDM	0.000 ± 0.026	.004/150	.004/150	.002/150	.003/150	
WIDTH DDM	0.129 TO 0.181	.177	.174	.181	.181	**
RF LEVEL	100.0 ± 10.0	94.2	99.7	94.0	99.6	
% MOD	LAST FC ± 0.004	41.1	47.4	41.2	41.2	
ID % MOD	005.0 ± 2.0	4.3	4.8	4.3	4.3	
FREQ SEP	9.5 ± 1.0	9.5	9.3	9.1	9.1	
FFM 1						
DDM	0.000 ± 0.005	.004/90	.003/90	.005/90	.005/90	
% MOD	40.0 ± 10.0	45	45	44	44	
FFM 2						
DDM	0.000 ± 0.005	.004/90	.004/90	.006/90	.006/90	
% MOD	40.0 ± 10.0	48	47	47	46	

REMARKS

- * - Clearance percent of modulation was reduced during the 17 December flight inspection sortie.
- ** - Monitor readings were not optimized during this flight inspection sortie.

SSILS G/S PRE-POST AIRBORNE EVALUATION CHECKLIST

DATE
18 December 1980

CHECK	SPECIFICATION	TRANSMITTER 1		TRANSMITTER 2		REMARKS
		PRE	POST	PRE	POST	
UPPER ANTENNA POWER						
CENTER ANTENNA POWER		25mW	26mW	27mW	26mW	
LOWER ANTENNA POWER		3.0W	3.0W	3.2W	3.0W	
COURSE % MODULATION		80%	78.8%	80%	78%	
CLEARANCE % MODULATION						
MONITORS COURSE I						
PATH (INT)	0.000 ± 0.050	.006/90	0	.001/90	0	
PATH (NF)	0.000 ± 0.050	.002/90	0	.001/150	0	
WIDTH DDM	0.145 TO 0.205	.168	.174	.183	.176	
RF LEVEL	100.0 ± 10.0	95.1	100.2	98.3	100.1	
% MOD	LAST FC ± 4.0	78.5	78.5	81.2	79.4	
COURSE II						
PATH (INT)	0.000 ± 0.050	.006/90	0	0	.001/150	
PATH (NF)	0.000 ± 0.050	.001/90	.001/150	.002/150	.001/150	
WIDTH DDM	0.145 TO 0.205	.176	.175	.190	.176	
RF LEVEL	100.0 ± 10.0	95.4	100.2	98.4	100.1	
% MOD	LAST FC ± 4.0	77.8	77.8	80.5	78.8	
CLEARANCE I						
RF LEVEL	100.0 ± 5.0					
% MOD	90.0 ± 5.0					
FREQ SEP	8.00 ± 5.0					
CLEARANCE II						
RF LEVEL	100.0 ± 5.0					
% MOD	90.0 ± 5.0					
FREQ SEP	8.00 ± 5.0					

REMARKS

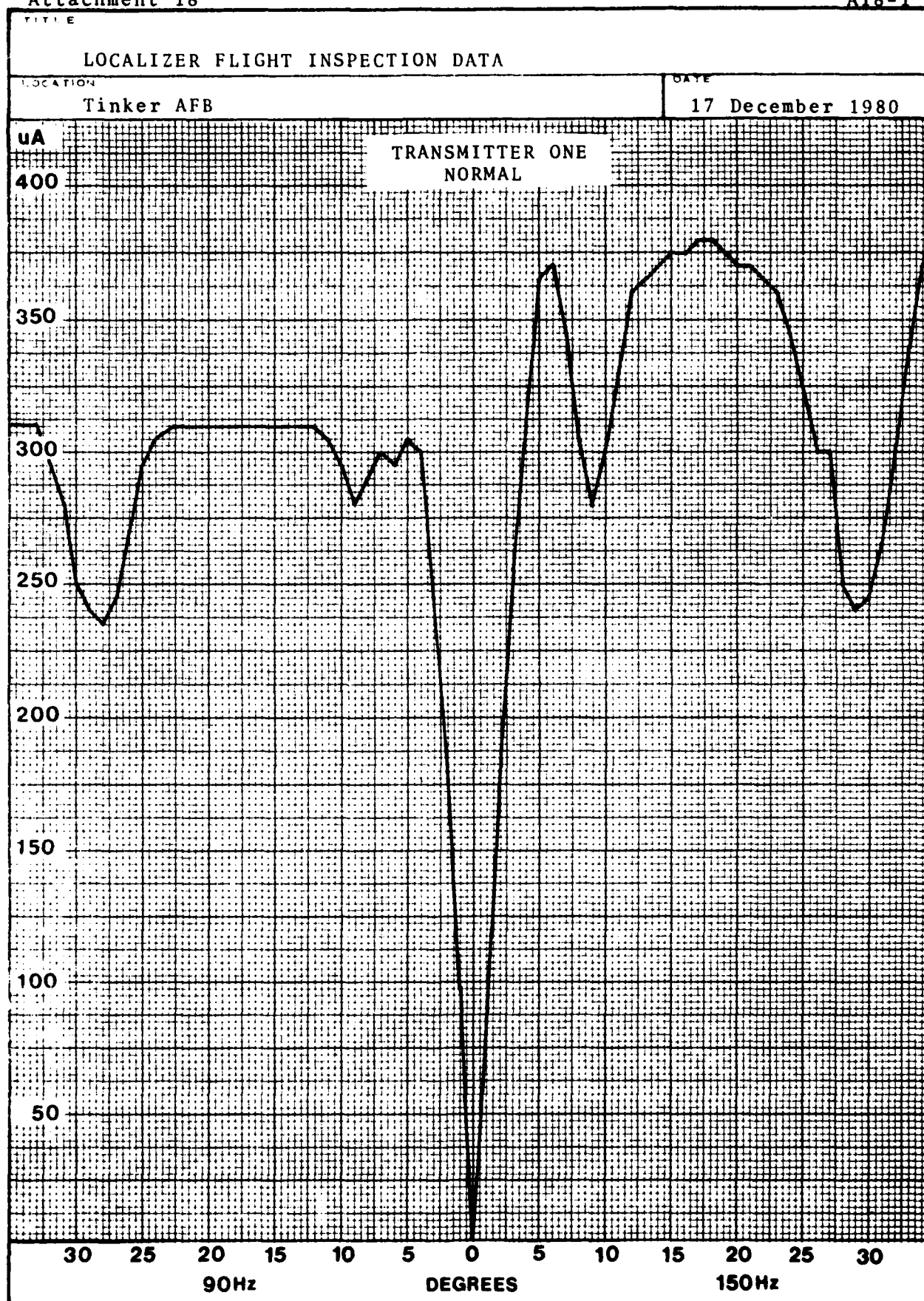
FLIGHT INSPECTION REPORT—INSTRUMENT LANDING SYSTEM

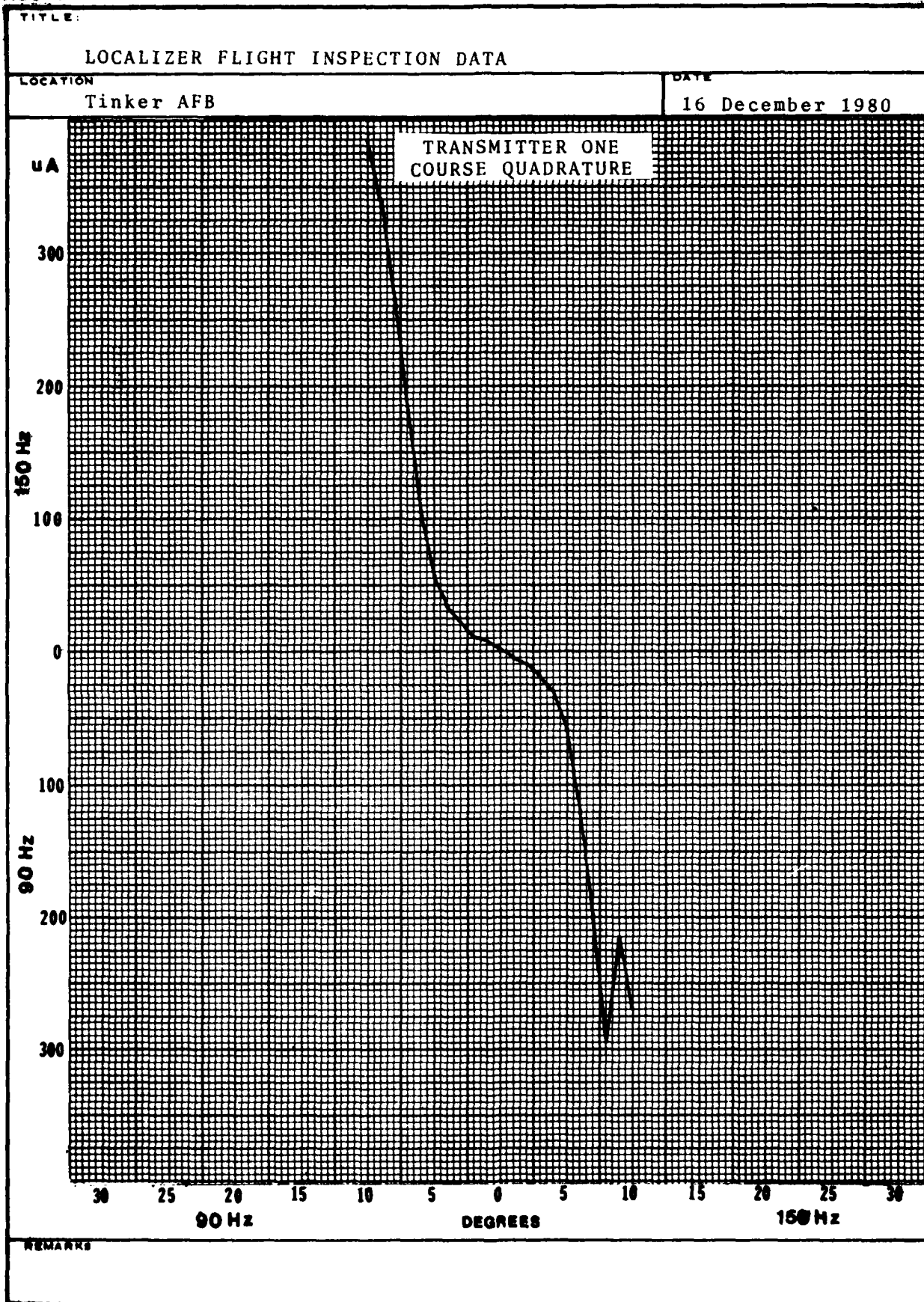
1. STATION Tinker AFB, OK				2. IDENT. RWY 17 JTZ		3. DATE/DATES OF INSPECTION 12/16-18/80				
4. TYPE OF INSPECTION								5. COMMON SYSTEM		
SITE EVALUATION		PERIODIC		<input checked="" type="checkbox"/> SPECIAL TRACALS		YES				
COMMISSIONING		SURVEILLANCE		INCOMPLETE		<input checked="" type="checkbox"/> NO				
6. OWNER		FAA		U.S. ARMY		PRIVATE (Indicate actual owner)				
				U.S. NAVY						
		INTER-NATIONAL		<input checked="" type="checkbox"/> U.S.A.F.		OTHER (Indicate actual owner)				
				U.S.C.G.						
7. FACILITY/COMPONENT INSPECTED				<input checked="" type="checkbox"/> LOCALIZER		COMPASS LOCATORS		<input checked="" type="checkbox"/> 75 MHz MARKERS		
				<input checked="" type="checkbox"/> GLIDE SLOPE		DME		<input checked="" type="checkbox"/> LIGHTING SYSTEM		
8. LOCALIZER										
FRONT COURSE						COMMISSIONED WIDTH 3.30		BACK COURSE		
TX 1			TX 2					TX 1		
OT	INIT.	FINAL	OT	INIT.	FINAL	CATEGORY	I	OT	INIT.	FINAL
		3.25		3.30	3.35	COURSE WIDTH				
		19.6			19.9	MODULATION				
		235/29				CLEARANCE 150				
		230/29				CLEARANCE 90				
		0			0	COURSE STRUCTURE—Z1				
		11/0.8			10/1.0	COURSE STRUCTURE—Z2				
		13/0.3			9/0.5	COURSE STRUCTURE—Z3				
		C/L			2uAL	ALIGNMENT				
						VOICE				
		S			S	IDENTIFICATION				
		18				USABLE DISTANCE				
						MONITOR				
		3.05			3.00	COURSE WIDTH (Narrow)				
		3.70			3.75	COURSE WIDTH (Wide)				
		205/29			195/28	CLEARANCE 150				
		200/29			200/28	CLEARANCE 90				
		10			10	ALIGNMENT 150				
		10			11	ALIGNMENT 90				
9. GLIDE SLOPE										
TX 1			TX 2			COM'D ANGLE 2.50		10. GENERAL		
OT	INIT.	FINAL	OT	INIT.	FINAL	CATEGORY	I	75 MHz MARKERS	SAT	UNSAT
		79			79.5	MODULATION		COMPASS LOCATORS	<input checked="" type="checkbox"/>	
		2.49			2.47	ANGLE		DME		
		0.71			0.73	WIDTH		LIGHTING SYSTEMS	<input checked="" type="checkbox"/>	
					S	CLEARANCE BELOW PATH		11. FACILITY STATUS		
		1.51			1.52	STRUCTURE BELOW PATH			F/C	G/S
		4/5.4			6/4.9	PATH STRUCTURE—Z1		UNRESTRICTED		X
		22/2.4			16/1.0	PATH STRUCTURE—Z2		RESTRICTED	X	
		8/0.3			3/0.3	PATH STRUCTURE—Z3		UNUSABLE		
		10				USABLE DISTANCE		NOTAM:		
						MONITOR				
						ANGLE (Low)				
						ANGLE (High)				
		0.89			0.79	PATH WIDTH (Wide)				
		S				CLEARANCE BELOW PATH				
12. REMARKS										
1. This was a special inspection/TRACALS Evaluation of number 1 transmitter, on an AN/GRN-29 ILS to RWY 17. Periodic requirements were fulfilled on both transmitters. TRACALS Evaluation was to investigate possible corrective actions for localizer structure problems from 1.5NM to threshold. 2. Localizer alignment and structure and glide slope actual angle and structure										
REGION		FIELD OFFICE		FLIGHT INSPECTOR'S SIGNATURE						
		1866 FCS		JAMES L. SMITH, Major, USAF						

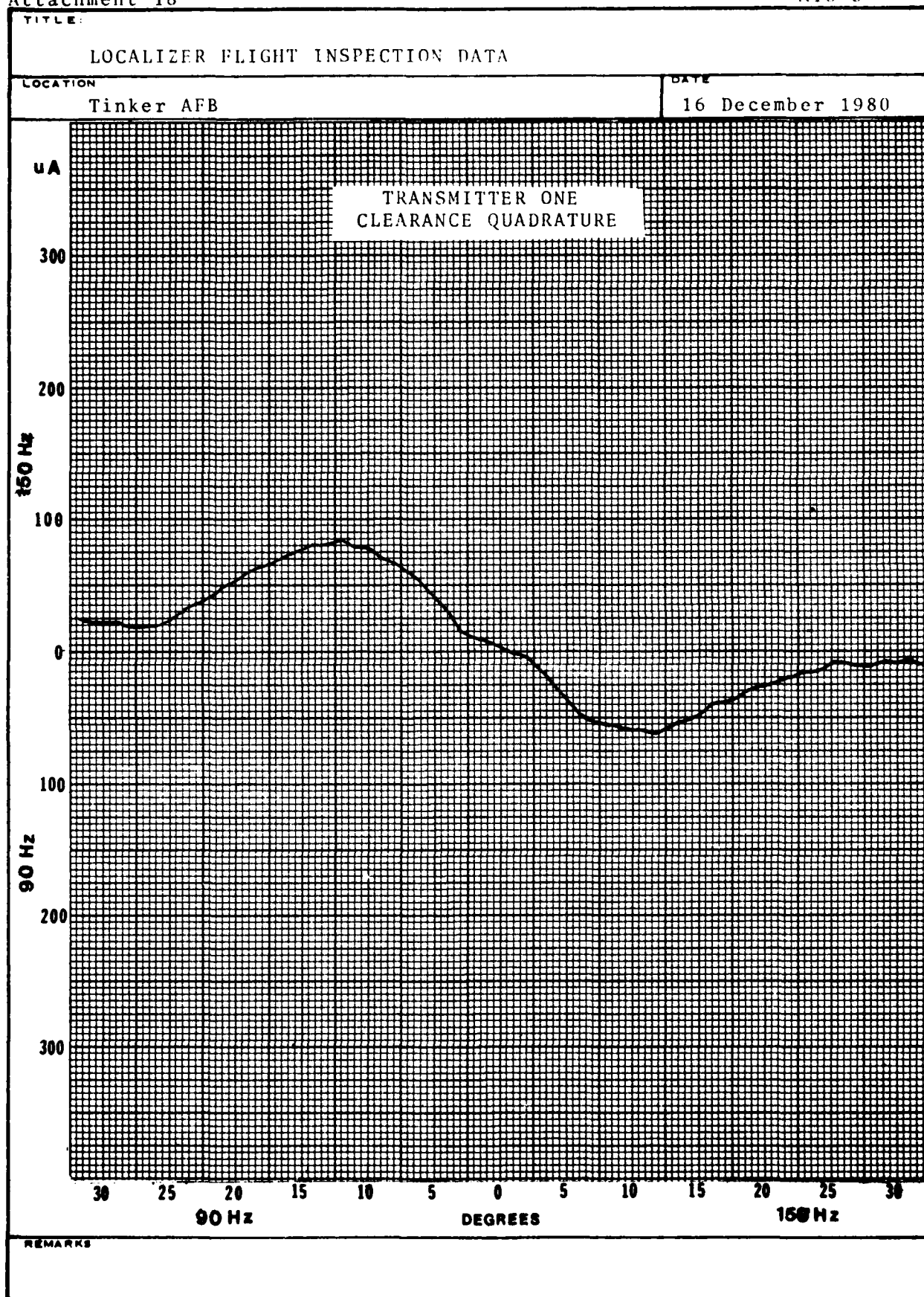
FLIGHT INSPECTION REPORT—INSTRUMENT LANDING SYSTEM SUPPLEMENT SHEET

1. STATION Tinker AFB, OK		RWY 17		2. IDENT. JTZ	3. DATE/DATES OF INSPECTION 12/16-18/80		
4. LOCALIZER							
4a. VERTICAL POLARIZATION		TX-1			TX-2		
		0 μ s			6 μ s		
4b. SYMMETRY		51 % 90 Hz		49 % 150 Hz		51 % 90 Hz	
						49 % 150 Hz	
5. GLIDE PATH							
		PATH ANGLE		PATH WIDTH		STRUCTURE BELOW PATH	
		TX-1	TX-2	TX-1	TX-2	TX-1	TX-2
5a. DEPHASE	ADVANCE 26/23°	2.52	2.54	0 .88	0 .85	1.20	1.28
	RETARD 15/18°	2.55	2.54	0 .89	0 .81	1.35	1.40
5b. PATH ANGLE LOWERED TO ALARM							
5c. PATH ANGLE RAISED TO ALARM							
5d. PATH WIDTH NARROWED TO ALARM		2.51		0 .61		1.48	
5e. PATH WIDTH WIDENED TO ALARM		2.52	2.53	0 .89	0 .79	1.34	1.38
5f. CLEARANCE TX MODULATION DECREASED TO ALARM							
5g. ATTENUATE MIDDLE ANT. TO ALARM							
5h. ATTENUATE UPPER ANT. TO ALARM							
5i. SYMMETRY \longrightarrow		TX-1			TX-2		
		39 % 90 Hz		61 % 150 Hz		47 % 90 Hz	
5j. MODULATION BALANCE \longrightarrow		TX-1			TX-2		
		0					
5k. PHASING \longrightarrow		TX-1			TX-2		
		2 μ s 150					
5l. FRONT COURSE AREA WHERE PHASING CONDUCTED \longrightarrow					On Course 0		Hz SIDE
5m. STRUCTURE BELOW PATH—CAPTURE EFFECT (Special procedures) \longrightarrow					TX-1		TX-2
6. REMARKS							
measured with RTT.							
3. Localizer alignment measured from 1NM from middle marker to middle marker.							
4. Localizer clearance only width 7.00°.							
5. CBP flown satisfactorily with TX advanced 26° to alarm because SBP was outside of service volume of the glide slope.							
6. Actual angle at localizer extremities: 90Hz side, 2.50°; 150Hz side, 2.43°.							
7. TX 1 mean width 0.68° mean symmetry 49% 90Hz, above path angle 2.88°, below path angle 2.14°.							

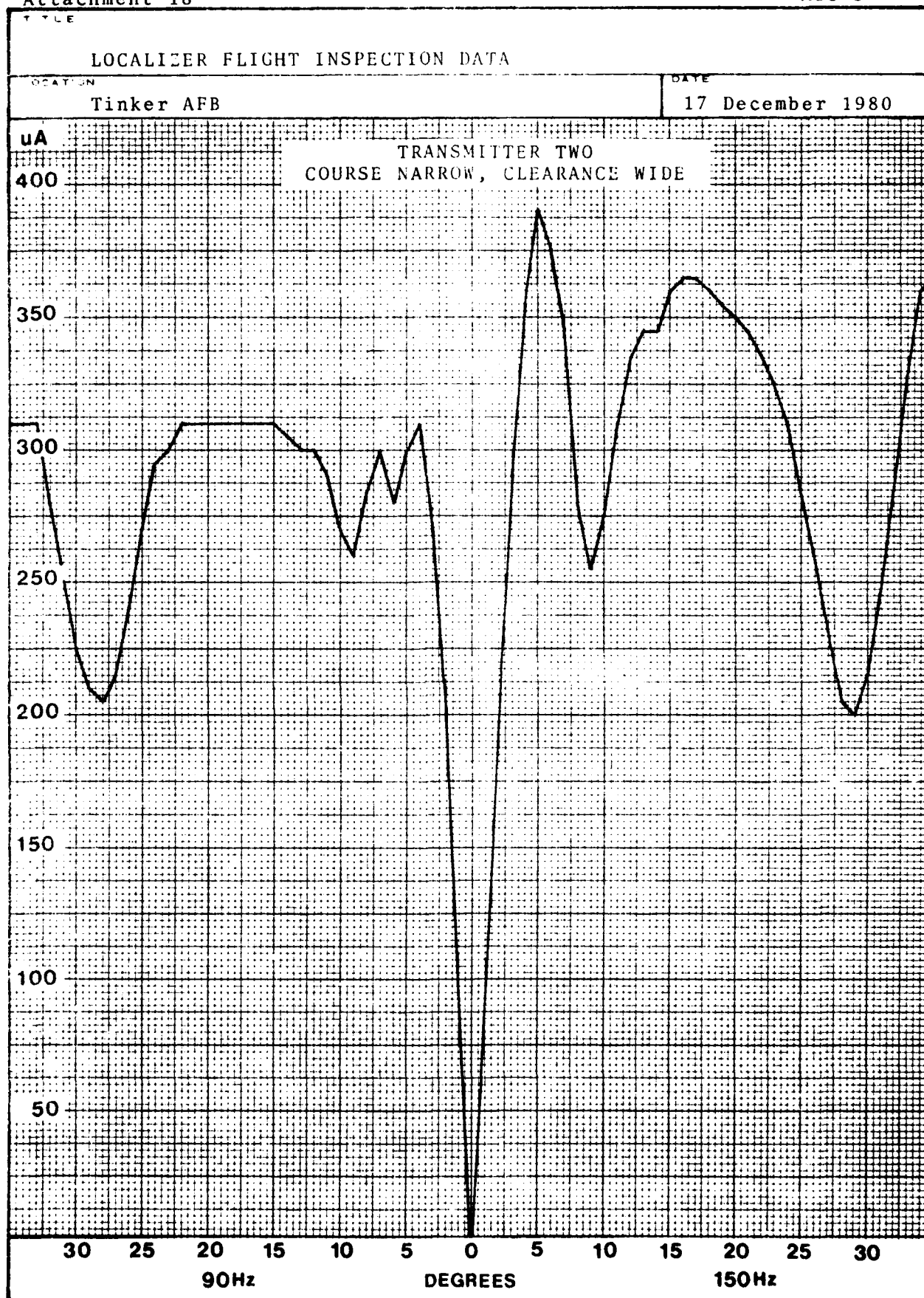
FLIGHT INSPECTION REPORT – CONTINUATION SHEET[illegible]



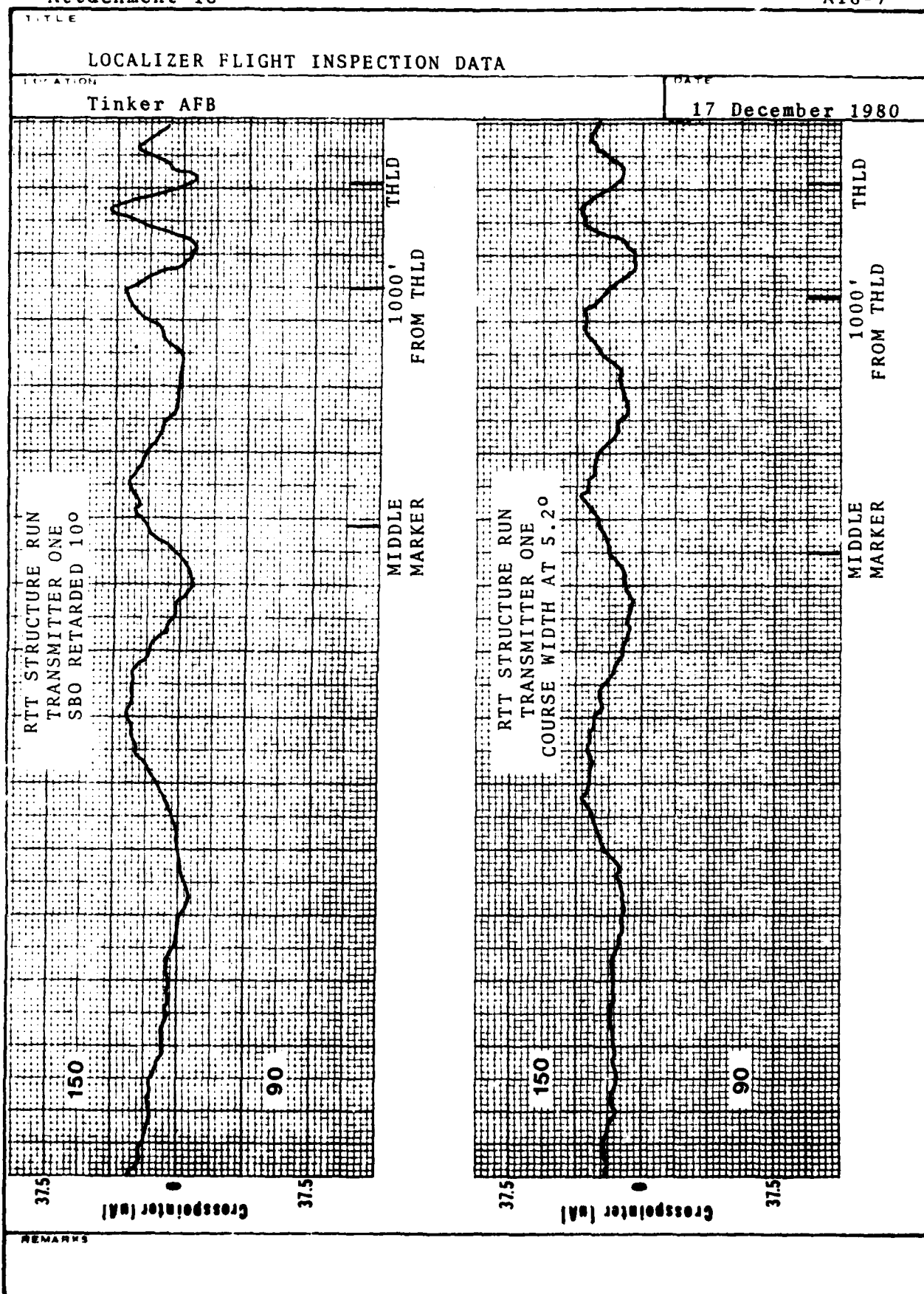








TITLE LOCALIZER FLIGHT INSPECTION DATA	
LOCATION Tinker AFB	DATE 16 December 1980
<p style="text-align: center;">STANDARD THEODOLITE BARREL RUN DESCENDING ON COURSE TO THE MIDDLE MARKER INTERCEPT ALTITUDE THEN LEVEL RUN INBOUND</p>	<p style="text-align: center;">STANDARD THEODOLITE BARREL RUN DESCENDING ON COURSE TO 400' AGL THEN LEVEL RUN INBOUND</p>
<p>REMARKS</p>	



AFCS FORM MAY 73 906

GENERAL INFORMATION

TITLE	
LOCALIZER FLIGHT INSPECTION DATA	
LOCATION	DATE
Tinker AFB	17 December 1980

RTT STRUCTURE RUN
TRANSMITTER ONE
ANTENNA PAIR #6 DUMMY LOADED

Crosspoint (mV)

1000' FROM THLD

MIDDLE MARKER

RTT STRUCTURE RUN
TRANSMITTER ONE
ANTENNA PAIR #7 DUMMY LOADED

Crosspoint (mV)

1000' FROM THLD

MIDDLE MARKER

REMARKS

TITLE		DATE	
LOCALIZER FLIGHT INSPECTION DATA		17 December 1980	
LOCATION		Tinker AFB	
<p>RTT STRUCTURE RUN TRANSMITTER ONE NORMAL</p>		<p>RTT STRUCTURE RUN TRANSMITTER TWO NORMAL</p>	
REMARKS			

TITLE:

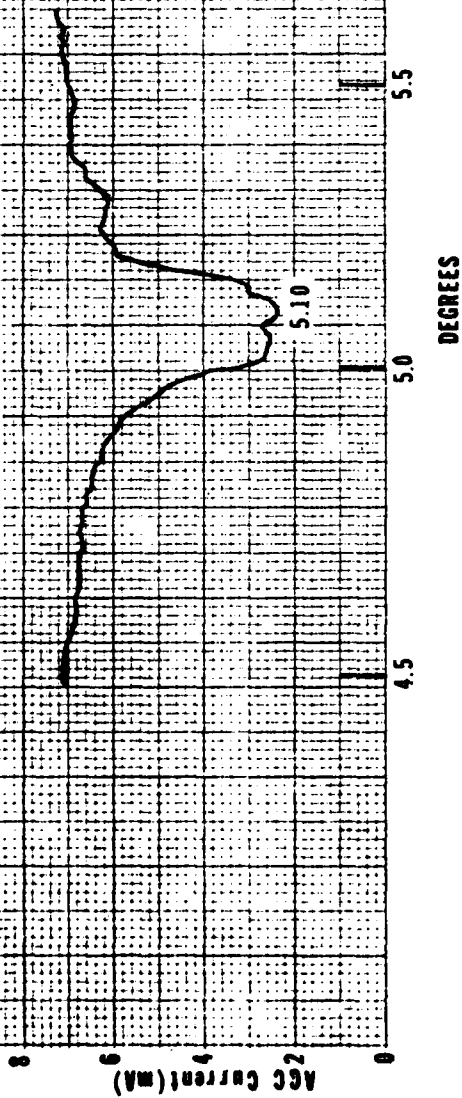
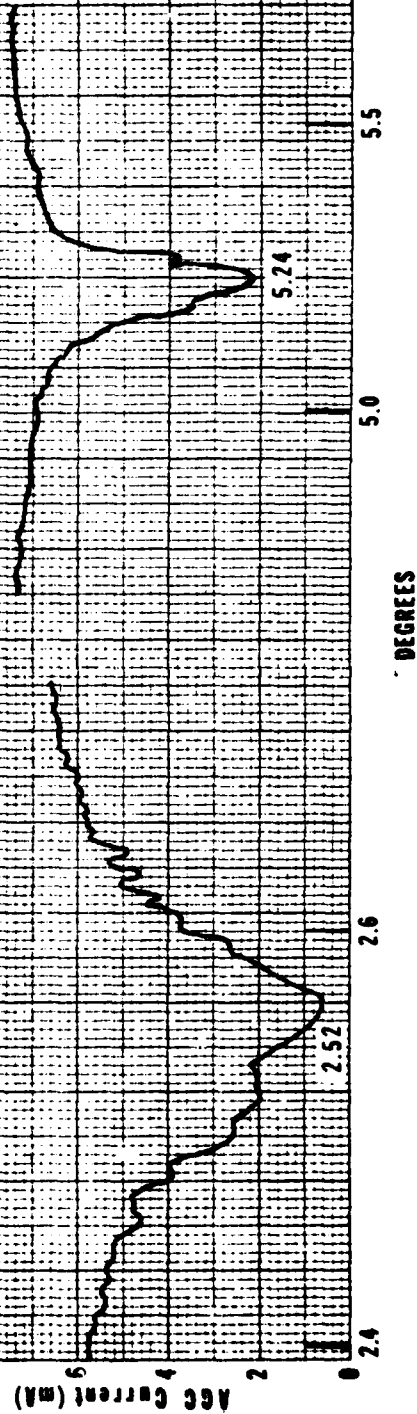
GLIDE SLOPE FLIGHT INSPECTION DATA

LOCATION

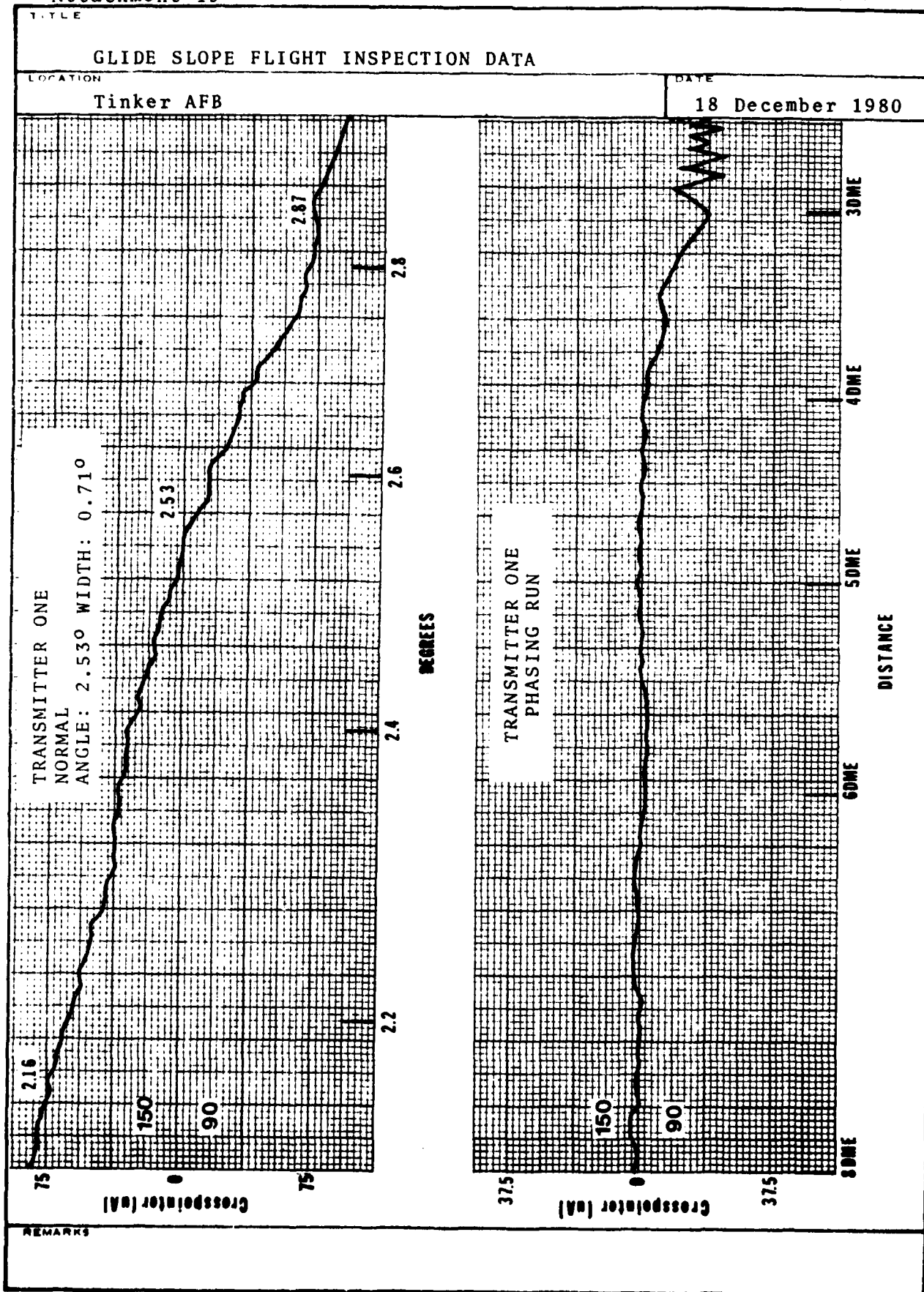
Tinker AFB

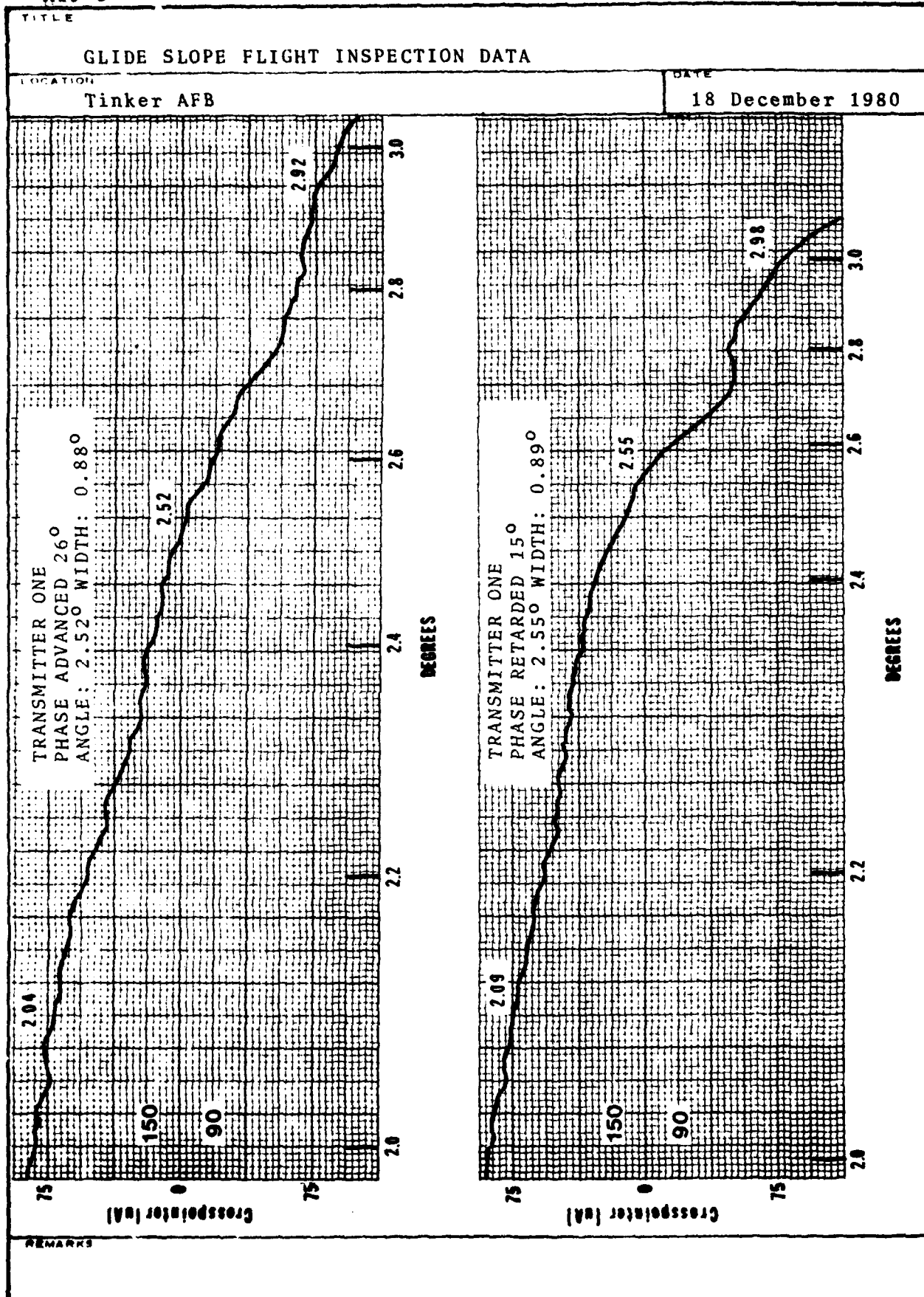
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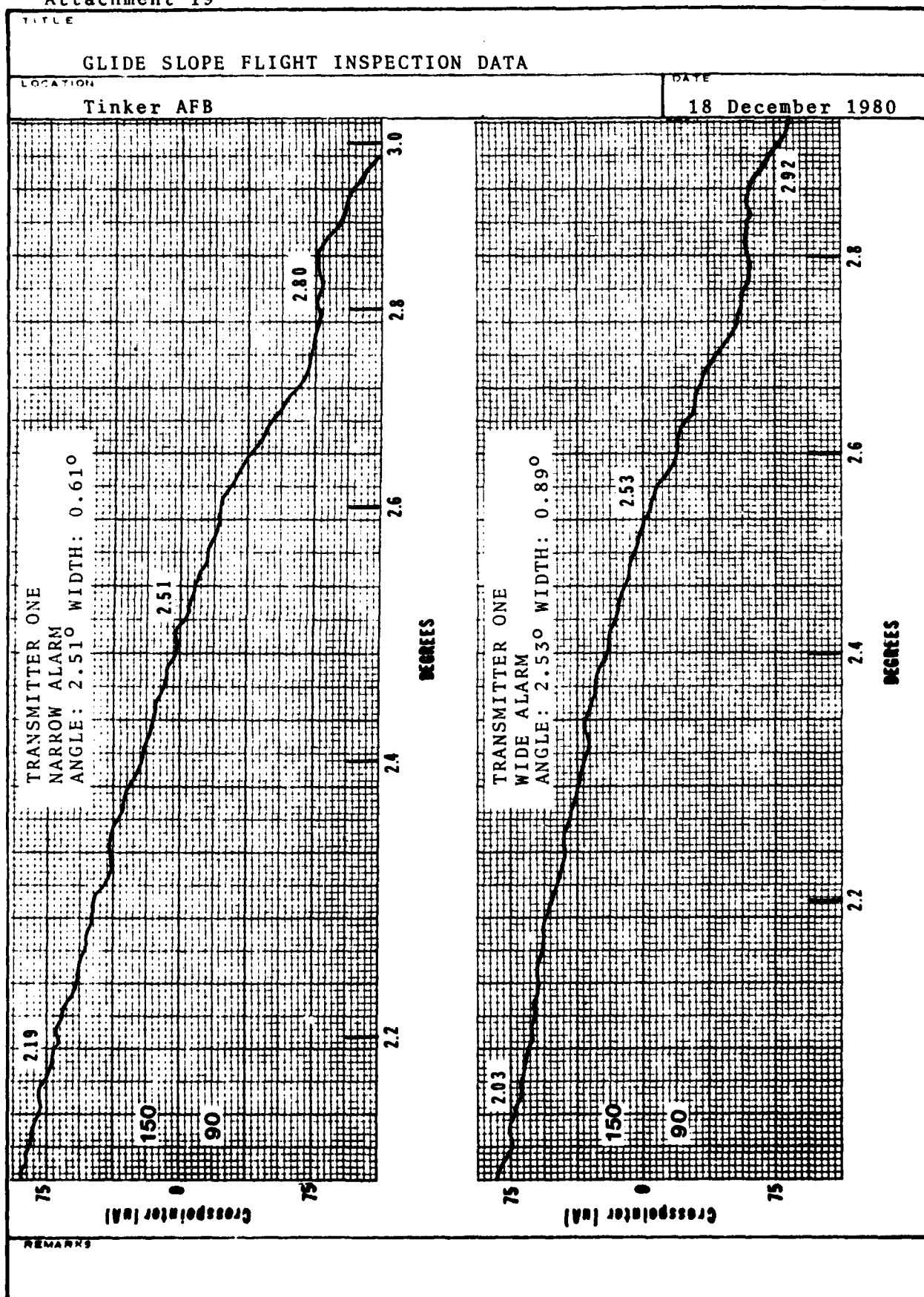
18 December 1980

LOWER ANTENNA
FIRST NULLUPPER ANTENNA
FIRST AND SECOND NULL

REMARKS







TITLE	
GLIDE SLOPE FLIGHT INSPECTION DATA	
LOCATION	DATE
Tinker AFB	18 December 1980

TRANSMITTER ONE
MEAN WIDTH ABOVE PATH
ANGLE: 2.82° WIDTH: 0.32°
SYMMETRY: 47%

Crosspoint (in)

TRANSMITTER ONE
MEAN WIDTH BELOW PATH
ANGLE: 2.14° WIDTH: 0.32°
SYMMETRY: 53%

Crosspoint (in)

REMARKS

74-00711

TITLE		LOCATION		DATE	
GLIDE SLOPE FLIGHT INSPECTION DATA		Tinker AFB		18 December 1980	

RTT STRUCTURE RUN
TRANSMITTER ONE
90HZ LOCALIZER EXTREME
AVERAGE ANGLE: 2.50°

Crosspoint (in)

RTT STRUCTURE RUN
TRANSMITTER ONE
150HZ LOCALIZER EXTREME
AVERAGE ANGLE: 2.43°

Crosspoint (in)

REMARKS

TITLE

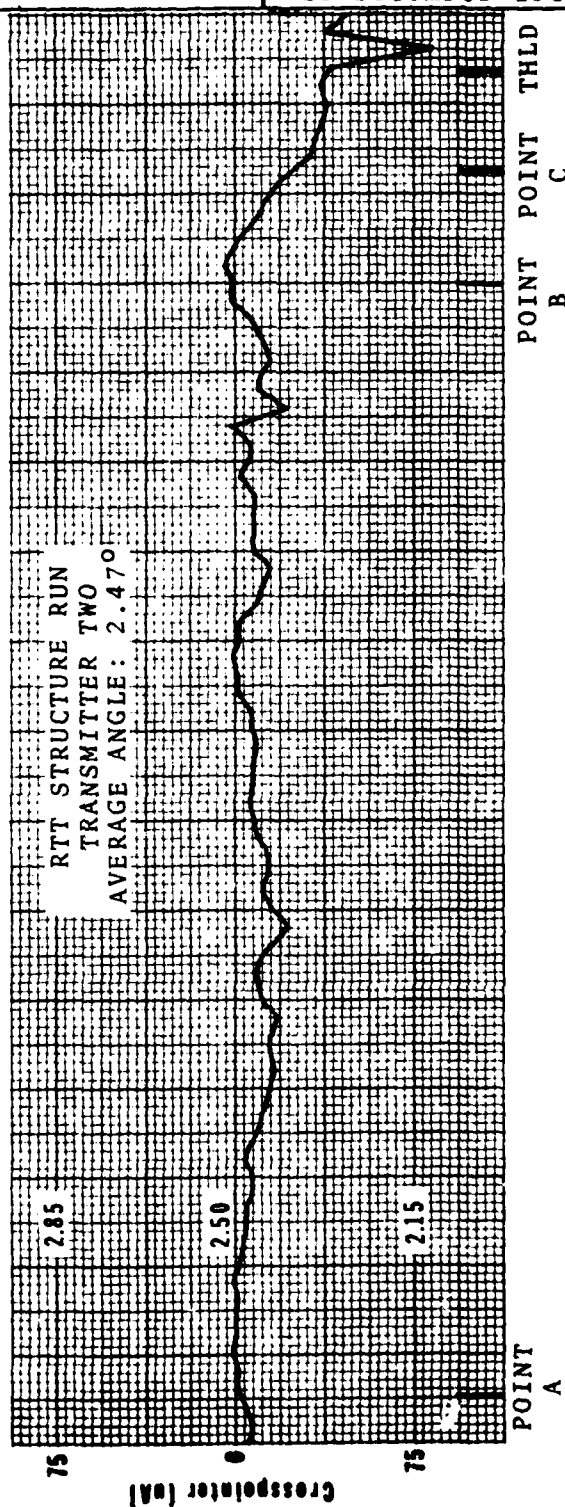
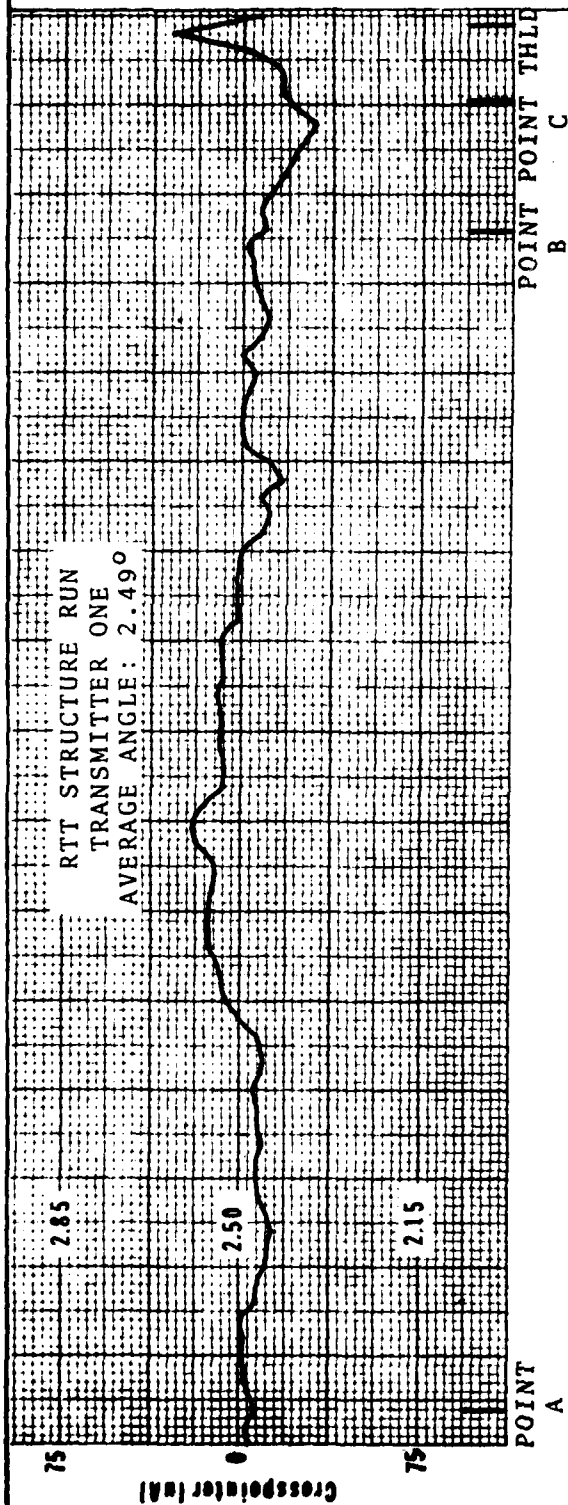
GLIDE SLOPE FLIGHT INSPECTION DATA

LOCATION

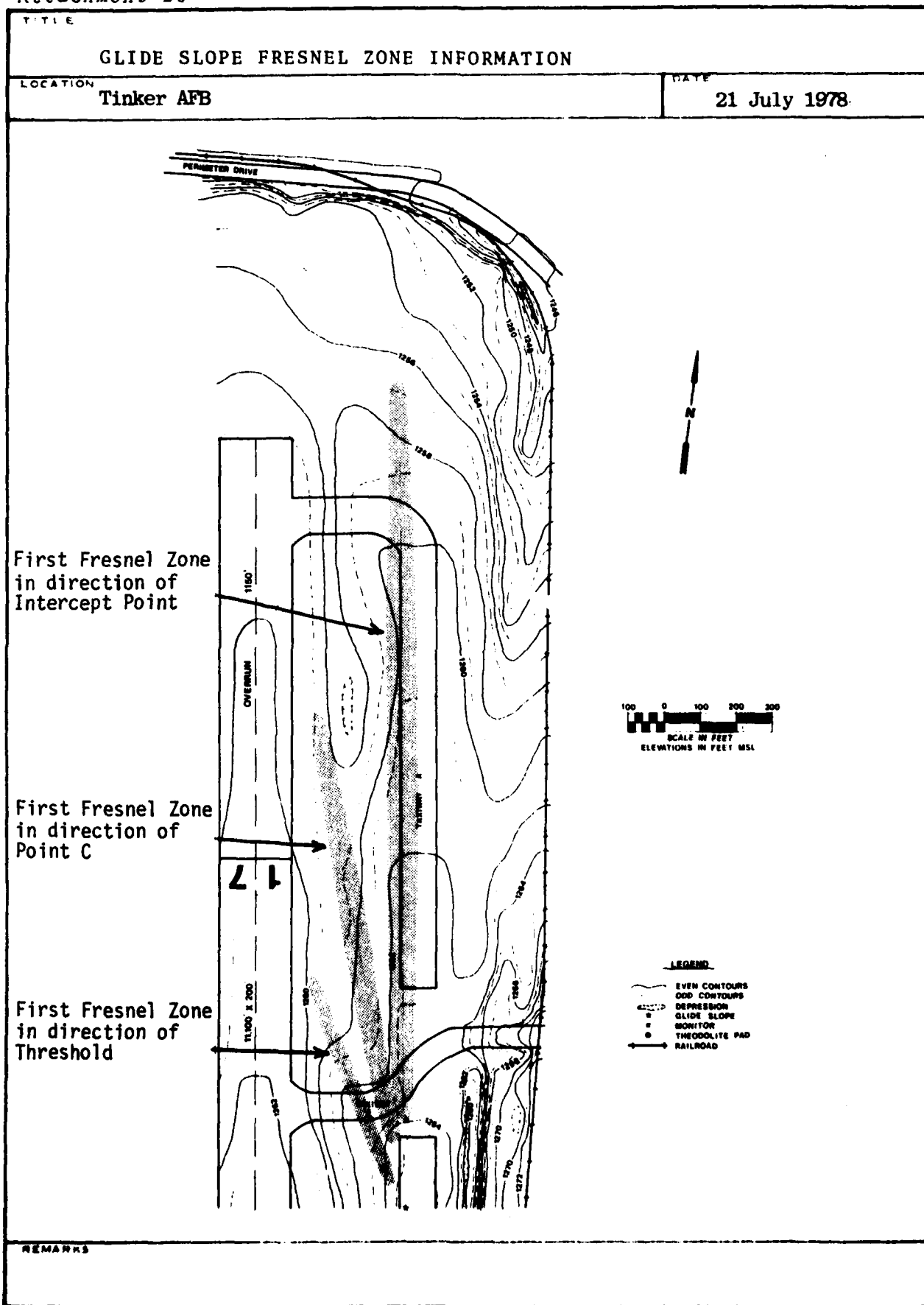
Tinker AFB

DATE

18 December 1980



REMARKS



90Hz

DEGREES

AFCS FORM MAY 73 906

GENERAL INFORMATION

A20-1

21 July 1978

200 200
SET
SET MSL

STOURS
TOUPS
ON
LOPE
ITE PAD

END

DATE
FILMED

7-8

DTIC